Test Result of Efficacy Test

Appendix 4

Korea Marine Equipment Research Institute

시 험 성 적 서

Testing Certificate

Korea Marine Equipment Research Institute

(재)한국조선해양기자재연구원
부산광역시 영도구 해양로 435 (우 606-806)
435 Haeyang-ro Yeongdo-gu 606-806 Busan Korea
Tel:+82-51-400-5000 Fax:+82-51-400-5091
http://www.komeri.re.kr

시험성적서 번호
Certificate No. :
KOMERI-GTA-11T582

■ 접수일자 : 2011. 06. 09
Date of Receipt

■ 접수번호 : 11T582
Receipt No.

■ 신 청 자 : Kawang San Co., Ltd.
Applicant

■ 주 소 : 1173-2, Jisa-dong, Gangseo-gu, Pusan, Korea
Address

■ 시 료 명 : BWMS
Name of Product

■ 모 델 : BioViolet™
Model

■ 일련번호 : -
Serial No.

■ 시험규격 : The Provisional Regulation for Type Approval of Ballast Water Management System by the Ministry of Land, Transport and Maritime Affairs (PR. No. 2011-342, Annex 4 and Annex 6) and Guidelines 8 (Res. MEPC. 174(58), Annex, PART 2, 2.3, 2.4 & Part 4)
Test Standard

■ 성적서 용도 : Type Approval by the Ministry of Land, Transport and Maritime Affairs (Land-based test)
Purpose of Testing Certificate

■ 시험기간 : 2011. 09. 01 ~ 2011. 12. 12
Test Period

■ 시험환경 : 온도 (20.0 ± 5.0) ℃, 습도 (50 ± 5) % R.H
Environment Temperature Humidity

■ 시험결과 : **Conformity**
Test Result

2012. 05. 02

시험원 *Tested by* 성명 *Name*	Jun-Hak Lee (서명)	기술책임자 *Technical Manager* 성명 *Name*	Young-soo Kim (서명)

(재)한국조선해양기자재연구원장 (인)

The President of Korea Marine Equipment Research Institute

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GENERAL

■ MANUFACTURER

☑ Same as the Applicant

Company Name : Kwang San Co., Ltd.

Address : 1173-2, Jisa-dong, Gangseo-gu, Pusan, Korea

■ ADDITIONAL TEST INFORMATION

Treatment Rated Capacity : 252 m^3/hr

Rated : AC 380 V, 60Hz

■ TEST SUMMARY

No.	Test Item	Test Standard	Result
1	LAND-BASED TEST	The Provisional Regulation for Type Approval of Ballast Water Management System by the Ministry of Land, Transport and Maritime Affairs (PR. No.2011-342, Annex 4 and Annex 6) and Guidelines 8 (IMO Res. MEPC. 174(58), Annex, PART 2, 2.3, 2.4 & Part 4)	Conformity

1. LAND-BASED TEST

1.1 TEST ENVIRONMENT

· Ambient temperature	(20.0 ± 5.0) ℃	※ 15.0 ℃ to 35.0 ℃
· Relative Humidity	(50 ± 5) % R.H.	※ 25 % R.H. to 75 % R.H.

1.2 TEST STANDARD

· Test standards are The Provisional Regulation for Type Approval of Ballast Water Management System by the Ministry of Land, Transport and Maritime Affairs (PR. No. 2011-342, Annex 4 & Annex 6) and Guidelines 8 (IMO Res. MEPC. 174(58), Annex, PART 2, 2.3, 2.4 & PART 4). Detailed test methods are as below;

	Item	Test standard	Remark
◆	pH	APHA Standard Method 4500 H^+ B:2012	Measurement with Electrode multiprobe (Hydrolab, USA)
◆	Water temperature	APHA Standard Method 2550:2012	
◆	DO	ASTM Standard Method D888-09 C:2010	
◆	ORP	APHA Standard Method 2580:2012	
◆	Salinity	APHA Standard Method 2520 B:2012	
◆	Turbidity	APHA Standard Method 2130 B:2012	Measurement with Turbidity meter (Hach, 2100 P)
◆	DOC/POC	ISO 8245:1999	-
◆	TSS	APHA Standard Method 2540 D:2012	-
◆	Viable organisms (≥ 50 μm)	Fleming & Coughlan, 1978, US EPA 600/R-10/146:2010, APHA Standard Method 10200 C:2012	Staining with Neutral Red, Touch with the point of a fine dissecting needle, Concentration techniques
◆	Viable organisms (≥ 10 - 50 μm)	Anja et al., 2005, APHA Standard Method 10200 C:2012	Fluorescence dyeing with 5-CFDA AM, Concentration techniques
◆	Heterotrophic bacteria	APHA Standard Method 9215:2012	-
◆	Total coliform	APHA Standard Method 9222 B:2012	-
◆	*Escherichia coli*	US EPA 1603:2009	-
◆	Intestinal Enterococci	US EPA 1600:2009	
◆	Toxicogenic *Vibrio cholerae* (O1, O139)	APHA Standard Method 9260 H:2012 and/or API 20E kit (BioMerieux, Inc.)	

1.3 TEST EQUIPMENT

	Description	Manufacturer	Model Number	Calibration Due
◆	Fluorescent microscope	Olympus	CKX41	-
◆	Sedgewick-Rafter chamber	Pyser-SGI	-	-
◆	Stereo microscope	Olympus	SZ40	-
◆	Bogorov counting chamber	DH Sci.	-	-
◆	Multiprobe (Hydrolab)	Hach company	Hydrolab DS5	-
◆	Turbidity meter	Hach company	2100 P	-
◆	Clean bench	SY Sci.	SH-150S	-
◆	Drying and heating oven	DH Sci.	WON-105	~ 2012. 12. 07
◆	Digital imaging	BAUMER	TDI DMC3	-
◆	Electronic balance	OHAUS	Pioneer™ Balances	~ 2012. 12. 06
◆	Autoclave	DH Sci.	WAC-60	~ 2012. 12. 07
◆	Incubator	DH Sci.	WIG-155	~ 2012. 12. 07
◆	Standard sieve	-	50 μm (diagonal)	~ 2012. 12. 05
◆	Standard sieve	-	30 μm (diagonal)	~ 2012. 12. 05
◆	Standard sieve	-	10 μm (diagonal)	-
◆	Plankton net	SA Sci.	conical type 50 μm (diagonal)	-
◆	Plankton net	SA Sci.	conical type 30 μm (diagonal)	-
◆	Plankton net	SA Sci.	conical type 10 μm, (diagonal)	-
◆	Auto pipette	Labnet International, inc.	BP-10000	~ 2012. 12. 06
◆	Auto pipette	Labnet International, inc.	BP-1000	~ 2012. 12. 06
◆	Auto pipette	Labnet International, inc.	BP-200	~ 2012. 12. 06
◆	Filtration system	Nalgene	350 mL	-
◆	Vacuum pump	Thomas	1617-353 series	-
◆	Mass cylinder	Witeg	100 mL	~ 2015. 06. 04
◆	Colony counter	SUNTEX	570	-
◆	Humidity Recorder	CENTER	342	~ 2012. 08. 05

1.4 TEST SET-UP

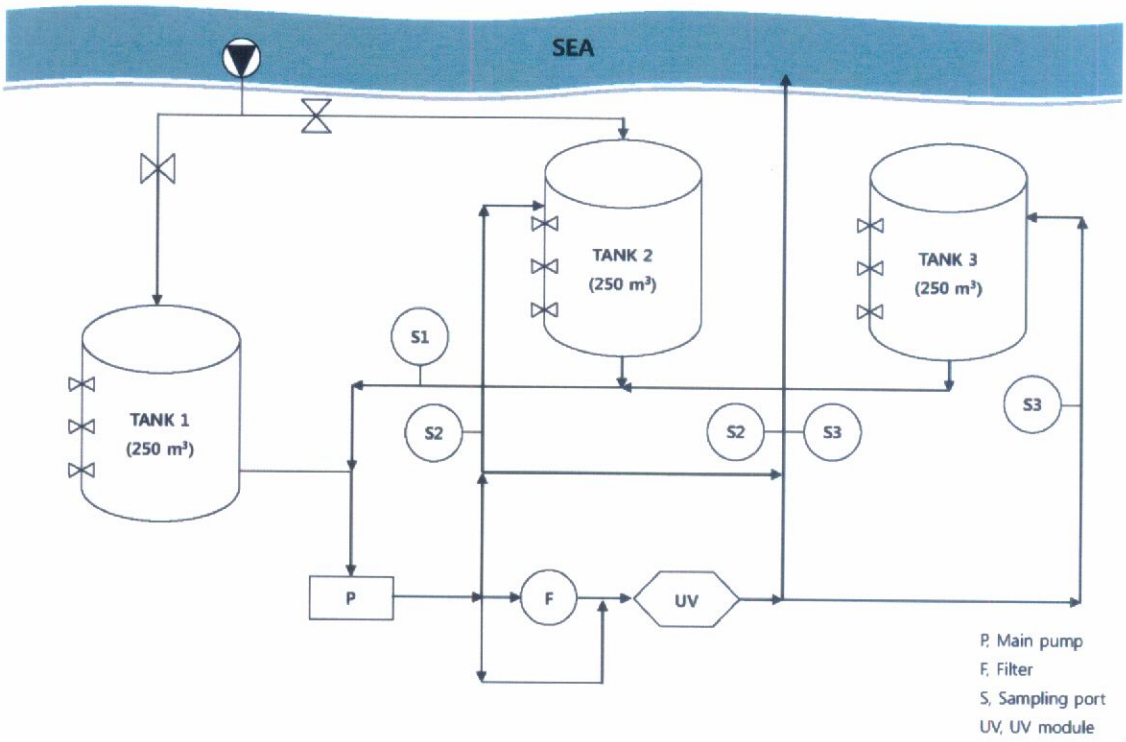


Figure 1-1 Schematic process diagram of the land-based test facility of the BioVioletTM BWMS

1.5 TEST PROCEDURE

· See Appendix Ⅱ. PROCEDURES OF LAND-BASED TEST.

1.6 TEST SCHEDULE

Period	Cycle	Test mode and date		Location
		Ballasting	de-Ballasting	
1 (3 - 32 PSU)	1	2011. 09. 01	2011. 09. 06	Goseong-gun, Gyeongsangnam-do
	2	2011. 09. 28	2011. 10. 03	
	3	2011. 10. 05	2011. 10. 10	
	4	2011. 10. 12	2011. 10. 17	
	5	2011. 10. 19	2011. 10. 24	
2 (> 32 PSU)	6	2011. 10. 26	2011. 10. 31	
	7	2011. 11. 02	2011. 11. 07	
	8	2011. 11. 09	2011. 11. 14	
	9	2011. 11. 16	2011. 11. 21	
	10	2011. 11. 23	2011. 11. 28	
	11*	2011. 12. 07	2011. 12. 12	

*11th testing was carried out under higher turbidity (> 100 NTU) than other test cycle.

1.7 TEST RESULTS

1.7.1 Assessment of valid test

(1) Basic water parameter of test (challenge) water

Period	Cycle	Salinity (PSU)	TSS (mg/L)	DOC (mg/L)	POC (mg/L)	Remarks
1 (3 - 32 PSU)	1	20.31	86.40	6.99	10.18	Conformity
	2	20.21	69.10	6.56	5.32	
	3	19.77	73.60	6.22	6.17	
	4	20.14	75.90	6.52	7.44	
	5	19.84	72.70	6.54	7.69	
Valid requirement		**3 - 32**	**> 50**	**> 5**	**> 5**	-
2 (> 32 PSU)	6	33.38	17.20	2.68	2.02	Conformity
	7	34.11	23.60	2.59	1.80	
	8	33.23	16.10	2.44	1.73	
	9	34.09	18.50	2.53	1.83	
	10	33.97	18.80	2.60	1.97	
	11*	34.01	267.70	1.55	1.75	
Valid requirement		**> 32**	**> 1**	**> 1**	**> 1**	-

※ Data indicates an arithmetic mean.
*11th testing was carried out under higher turbidity (> 100 NTU) than other test cycle.

(2) Viable organisms of test (challenge) water

Period	Cycle	≥ 50 μm organisms (inds./m^3)	≥ 10 - 50 μm organisms (inds./mL)	Heterotrophic bacteria (cells/mL)	Remarks
1 (3 - 32 PSU)	1	249 334	1 930	34 864	Conformity
	2	188 000	1 239	52 364	
	3	147 000	2 830	23 455	
	4	127 834	2 730	12 318	
	5	121 167	2 242	59 000	
2 (> 32 PSU)	6	136 000	2 425	44 273	
	7	197 667	2 853	50 500	
	8	192 167	1 620	14 273	
	9	160 667	2 211	10 273	
	10	137 334	2 931	25 273	
	11*	131 000	2 623	11 733	
Valid requirement		**≥ 100 000**	**≥ 1 000**	**≥ 10 000**	-

※ Data indicates an arithmetic mean.
*11th testing was carried out under higher turbidity (> 100 NTU) than other test cycle.

(3) Organisms diversity of test (challenge) water

Period	Cycle	≥ 50 μm organisms	≥ 10 - 50 μm organisms	Remarks
1 (3 - 32 PSU)	1	4 Phyla/Division 10 species	3 Phyla/Division 5 species	Conformity
	2	4 Phyla/Division 9 species	3 Phyla/Division 6 species	
	3	3 Phyla/Division 10 species	3 Phyla/Division 9 species	
	4	4 Phyla/Division 8 species	3 Phyla/Division 5 species	
	5	5 Phyla/Division 10 species	4 Phyla/Division 10 species	
2 (> 32 PSU)	6	4 Phyla/Division 10 species	4 Phyla/Division 8 species	
	7	4 Phyla/Division 11 species	3 Phyla/Division 10 species	
	8	5 Phyla/Division 13 species	4 Phyla/Division 9 species	
	9	4 Phyla/Division 10 species	3 Phyla/Division 6 species	
	10	3 Phyla/Division 7 species	3 Phyla/Division 7 species	
	11*	3 Phyla/Division 5 species	3 Phyla/Division 5 species	
Valid requirement		**≥ 3 Phyla/Division 5 species**	**≥ 3 Phyla/Division 5 species**	-

*11th testing was carried out under higher turbidity (> 100 NTU) than other test cycle.

(4) Viable organisms of discharge control water

Period	Cycle	≥ 50 μm organisms (inds./m^3)	≥ 10 - 50 μm organisms (inds./mL)	Remarks
1 (3 - 32 PSU)	1	43 028	180	Conformity
	2	38 278	362	
	3	68 223	528	
	4	52 001	289	
	5	40 556	1 140	
2 (> 32 PSU)	6	41 751	414	
	7	86 945	452	
	8	27 612	353	
	9	15 945	653	
	10	30 889	1 501	
	11*	22 278	633	
Valid requirement		**> 100**	**> 100**	-

※ Data indicates an arithmetic mean.
*11th testing was carried out under higher turbidity (> 100 NTU) than other test cycle.

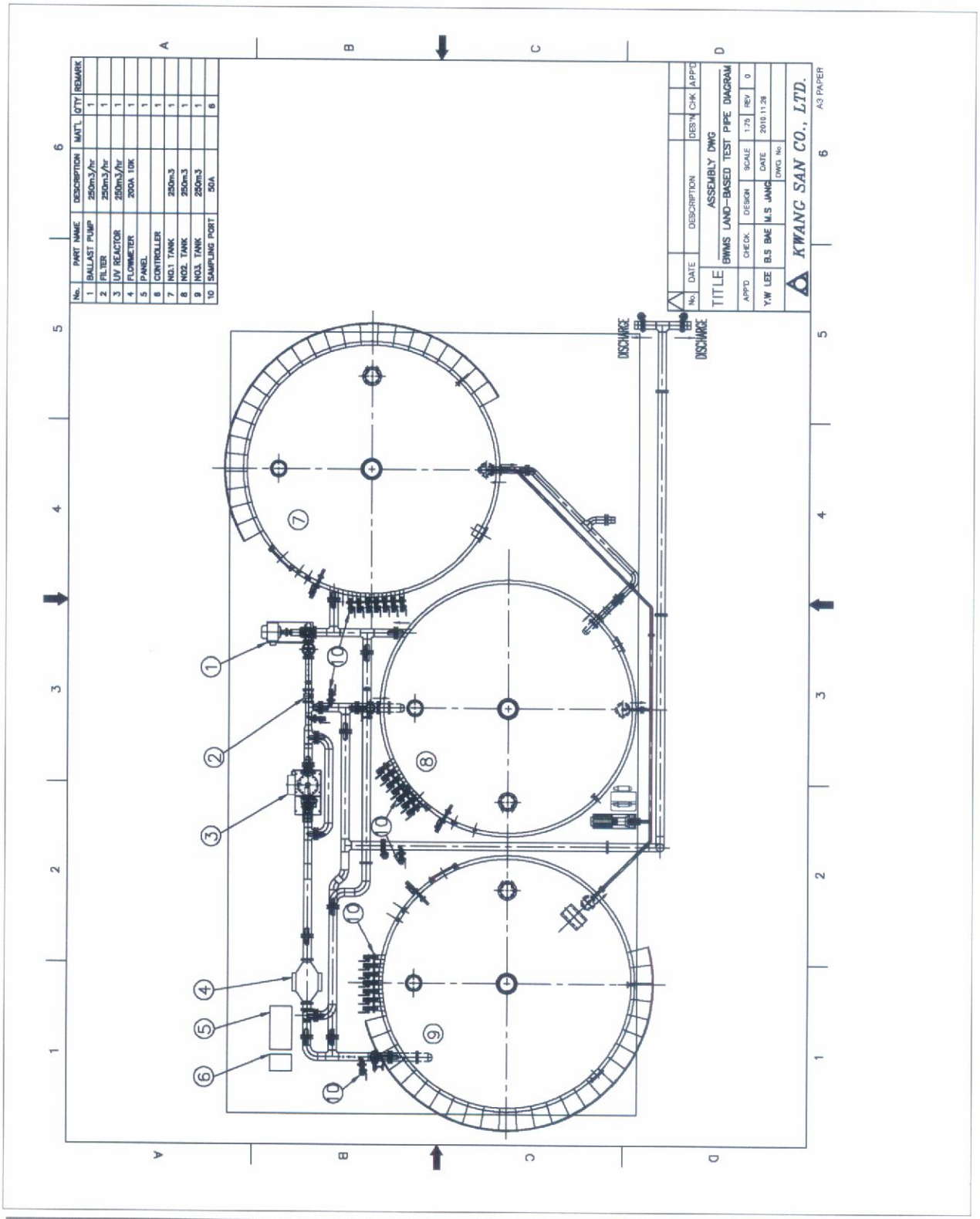
1.7.2 Assessment of discharge treated water

Period	Cycle	≥ 50 μm organisms (inds./m^3)	≥ 10 - 50 μm organisms (inds./mL)	*Escherichia coli*	Intestinal Enterococci	Toxicogenic *Vibrio cholerae* (O1, O139)	Remarks
1 (3 - 32 PSU)	1	1	1	0	1	0	Conformity
	2	0	1	0	0	0	
	3	0	1	0	0	0	
	4	0	2	0	0	0	
	5	0	3	0	0	0	
2 (> 32 PSU)	6	0	1	0	0	0	
	7	0	1	0	0	0	
	8	0	1	0	0	0	
	9	0	1	0	0	0	
	10	0	7	1	0	0	
	11*	0	3	0	0	0	
Discharge Standard		**< 10**	**< 10**	**< 250**	**< 100**	**< 1**	-

※ Data indicates an arithmetic mean.
*11th testing was carried out under higher turbidity (> 100 NTU) than other test cycle.

ATTACHMENT

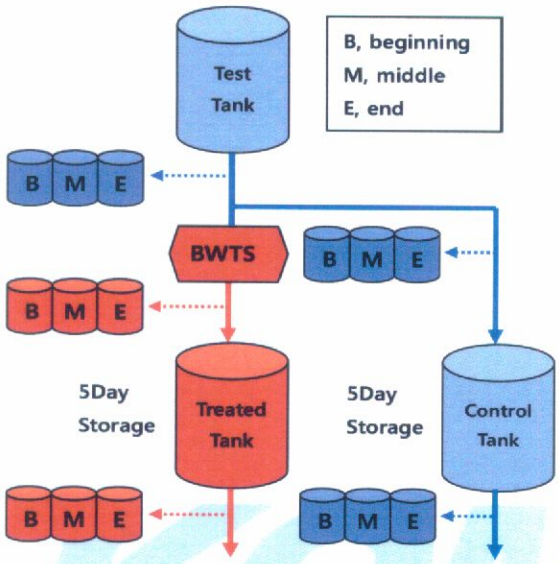
I. DRAWING



II. PROCEDURE ON LAND-BASED TEST

KOMERI SOP BWMS 01
Rev. 3.0 May 2011

BWMS Test Procedures of Land-Based Test



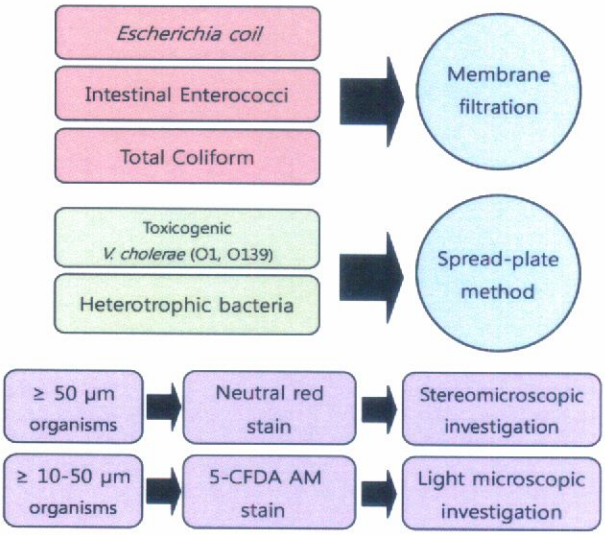
<Standard for valid test>

Salinity in the test water			
	> 32 PSU	3-32 PSU	< 3 PSU
DOC	> 1 mg/L	> 5 mg/L	> 5 mg/L
POC	> 1 mg/L	> 5 mg/L	> 5 mg/L
TSS	> 1 mg/L	> 50 mg/L	> 50 mg/L

Density of organisms in the test water	
≥ 50 μm organisms	≥ 3 Phyla/Division 5 species ≥ 100,000 inds./m^3
≥ 10-50 μm organisms	≥ 3 Phyla/Division 5 species ≥ 1,000 inds./mL
Heterotrophic bacteria	≥ 10,000 cells/mL

Density of organisms in the treated water		
≥ 50 μm organisms		< 10 inds./m^3
≥ 10-50 μm organisms		< 10 inds./mL
Bacteria	Toxicogenic *Vibrio cholerae* (O1, O139)	< 1 cfu/100 mL
	Escherichia coil	< 250 cfu/100mL
	Intestinal Enterococci	< 100 cfu/100mL

Sample volume			
Ballasting	Test water	≥ 50 μm organisms	20 L
		≥ 10-50 μm organisms	1 L
		Bacteria	1 L
	Control water	≥ 50 μm organisms	20 L
		≥ 10-50 μm organisms	1 L
		Bacteria	1 L
	Treated water	≥ 50 μm organisms	1 m^3
		≥ 10-50 μm organisms	10 L
		Bacteria	2 L
de-Ballasting	Control water	≥ 50 μm organisms	20 L
		≥ 10-50 μm organisms	1 L
		Bacteria	1 L
	Treated water	≥ 50 μm organisms	1 m^3
		≥ 10-50 μm organisms	10 L
		Bacteria	2 L



III. TEST RESULT DETAILS

TEST RESULTS IN 3 - 32 PSU (1st cycle: 2011. 09. 01 - 2011. 09. 06)

Test Item	Ballasting			de-Ballasting	
	Test water	Control water	Treated water	Control water	Treated water
Water temperature (°C)	25.18	25.18	25.40	26.12	26.36
pH	8.51	8.51	8.52	7.33	7.19
ORP (mV)	279	240	262	300	259
Salinity (PSU)	20.31	20.40	20.32	20.32	20.34
DO (mg/L)	7.48	7.39	7.44	5.17	4.62
Turbidity (NTU)	25.00	28.83	24.10	23.50	20.40
Total suspended solid (mg/L)	86.40	94.73	86.50	78.93	56.13
Dissolved organic carbon (mg/L)	6.99	7.10	7.50	2.34	6.68
Particulate organic carbon (mg/L)	10.18	9.15	6.27	1.15	0.56
≥ 50 μm organisms (inds./m^3)	249 334	264 668	192	43 028	1
≥ 10 - 50 μm organisms (inds./mL)	1 930	2 051	15	180	1
Heterotrophic bacteria (cells/mL)	34 864	14 400	271	51 334	437
Total coliform	TNTC*	TNTC	11	43	9
Escherichia coli	TNTC	577	0	3	0
Intestinal Enterococci	50	40	0	7	1
Toxicogenic *Vibrio cholerae* (O1, O139)	0	0	0	0	0

*TNTC, Too Numerous To Count

TEST RESULTS IN 3 - 32 PSU (2nd test cycle: 2011. 09. 28 - 2011. 10. 03)

Test Item	Ballasting			de-Ballasting	
	Test water	Control water	Treated water	Control water	Treated water
Water temperature (°C)	23.95	23.42	24.05	20.97	21.38
pH	8.31	8.34	8.34	7.41	7.25
ORP (mV)	365	318	314	369	378
Salinity (PSU)	20.21	20.25	20.23	20.26	20.14
DO (mg/L)	7.69	7.62	7.67	7.49	5.10
Turbidity (NTU)	20.10	21.37	22.00	14.43	17.90
Total suspended solid (mg/L)	69.10	74.87	67.77	60.83	67.00
Dissolved organic carbon (mg/L)	6.56	6.46	6.49	2.49	2.66
Particulate organic carbon (mg/L)	5.32	6.62	7.13	0.31	2.67
≥ 50 μm organisms (inds./m^3)	188 000	172 445	2	38 278	0
≥ 10 - 50 μm organisms (inds./mL)	1 239	1 317	92	362	1
Heterotrophic bacteria (cells/mL)	52 364	31 789	36	64 045	61
Total coliform	TNTC*	TNTC	1	479	0
Escherichia coli	TNTC	TNTC	1	106	0
Intestinal Enterococci	67	42	0	0	0
Toxicogenic *Vibrio cholerae* (O1, O139)	0	0	0	0	0

*TNTC, Too Numerous To Count

TEST RESULTS IN 3 - 32 PSU (3rd test cycle: 2011. 10. 05 - 2011. 10. 10)

Test Item	Ballasting			de-Ballasting	
	Test water	Control water	Treated water	Control water	Treated water
Water temperature (°C)	21.61	21.49	21.69	20.45	20.52
pH	8.28	8.35	8.33	7.71	7.60
ORP (mV)	343	308	291	300	306
Salinity (PSU)	19.77	19.93	19.78	19.86	19.71
DO (mg/L)	7.84	7.79	7.82	7.54	5.35
Turbidity (NTU)	20.60	21.87	20.67	19.87	21.50
Total suspended solid (mg/L)	73.60	73.00	75.77	71.67	79.03
Dissolved organic carbon (mg/L)	6.22	6.32	6.18	2.78	2.31
Particulate organic carbon (mg/L)	6.17	7.44	7.00	2.97	4.87
≥ 50 μm organisms (inds./m^3)	147 000	148 278	4	68 223	0
≥ 10 - 50 μm organisms (inds./mL)	2 830	2 763	1	529	1
Heterotrophic bacteria (cells/mL)	23 455	18 322	53	72 856	143
Total coliform	TNTC*	TNTC	2	1 197	0
Escherichia coli	723	TNTC	0	119	0
Intestinal Enterococci	20	8	0	3	0
Toxicogenic *Vibrio cholerae* (O1, O139)	0	0	0	0	0

*TNTC, Too Numerous To Count

TEST RESULTS IN 3 - 32 PSU (4th test cycle: 2011. 10. 12 - 2011. 10. 17)

Test Item	Ballasting			de-Ballasting	
	Test water	Control water	Treated water	Control water	Treated water
Water temperature (°C)	21.56	21.69	21.76	19.86	19.92
pH	8.54	8.55	8.53	6.17	6.22
ORP (mV)	272	258	245	282	298
Salinity (PSU)	20.14	20.14	20.16	19.93	19.94
DO (mg/L)	7.90	7.87	7.83	7.70	7.15
Turbidity (NTU)	23.80	22.53	23.20	19.93	21.27
Total suspended solid (mg/L)	75.90	77.77	74.03	63.90	74.23
Dissolved organic carbon (mg/L)	6.52	6.38	6.63	2.86	2.32
Particulate organic carbon (mg/L)	7.44	7.09	7.11	2.09	3.24
≥ 50 μm organisms (inds./m^3)	127 834	128 112	6	52 001	0
≥ 10 - 50 μm organisms (inds./mL)	2 730	2 030	11	289	2
Heterotrophic bacteria (cells/mL)	12 318	14 378	68	47 411	37
Total coliform	TNTC*	TNTC	3	791	1
Escherichia coli	43	24	0	1	0
Intestinal Enterococci	10	7	0	0	0
Toxicogenic *Vibrio cholerae* (O1, O139)	0	0	0	0	0

*TNTC, Too Numerous To Count

TEST RESULTS IN 3 - 32 PSU (5th test cycle: 2011. 10. 19 - 2011. 10. 24)

Test Item	Ballasting			de-Ballasting	
	Test water	Control water	Treated water	Control water	Treated water
Water temperature (°C)	20.07	20.10	20.28	18.25	18.47
pH	8.53	8.52	8.51	7.69	7.56
ORP (mV)	304	295	303	327	359
Salinity (PSU)	19.84	20.02	19.85	19.92	19.65
DO (mg/L)	8.06	7.97	8.03	7.88	6.48
Turbidity (NTU)	23.00	24.10	24.87	18.10	20.53
Total suspended solid (mg/L)	72.70	73.70	72.67	71.33	73.00
Dissolved organic carbon (mg/L)	6.54	6.50	6.62	2.18	2.77
Particulate organic carbon (mg/L)	7.69	7.45	7.46	0.57	0.69
≥ 50 μm organisms (inds./m^3)	121 167	102 001	27	40 556	0
≥ 10 - 50 μm organisms (inds./mL)	2 242	2 401	286	1 140	3
Heterotrophic bacteria (cells/mL)	59 000	51 645	43	16 889	54
Total coliform	TNTC*	TNTC	2	694	1
Escherichia coli	3	200	0	3	0
Intestinal Enterococci	17	49	0	0	0
Toxicogenic *Vibrio cholerae* (O1, O139)	0	0	0	0	0

*TNTC, Too Numerous To Count

TEST RESULTS IN > 32 PSU (6th test cycle: 2011. 10. 26 - 2011. 10. 31)

Test Item	Ballasting			de-Ballasting	
	Test water	Control water	Treated water	Control water	Treated water
Water temperature (°C)	17.69	17.27	17.77	16.99	17.10
pH	8.34	8.37	8.38	8.07	8.06
ORP (mV)	288	264	265	329	343
Salinity (PSU)	33.38	33.66	33.28	33.78	33.86
DO (mg/L)	7.80	7.67	7.77	7.34	7.42
Turbidity (NTU)	5.46	4.35	4.52	3.31	3.03
Total suspended solid (mg/L)	17.20	18.70	20.73	15.23	15.97
Dissolved organic carbon (mg/L)	2.68	2.66	2.75	1.63	1.91
Particulate organic carbon (mg/L)	2.02	1.80	1.83	0.19	0.16
≥ 50 μm organisms (inds./m^3)	136 000	123 223	18	41 751	0
≥ 10 - 50 μm organisms (inds./mL)	2 425	2 870	1	414	1
Heterotrophic bacteria (cells/mL)	44 273	12 234	81	TNTC	0
Total coliform	TNTC*	TNTC	2	4	0
Escherichia coli	157	118	0	0	0
Intestinal Enterococci	0	0	0	0	0
Toxicogenic *Vibrio cholerae* (O1, O139)	0	0	0	0	0

*TNTC, Too Numerous To Count

TEST RESULTS IN > 32 PSU (7th test cycle: 2011. 11. 02 - 2011. 11. 07)

Test Item	Ballasting			de-Ballasting	
	Test water	Control water	Treated water	Control water	Treated water
Water temperature (°C)	18.37	18.39	18.62	18.94	19.25
pH	8.28	8.44	8.45	8.04	8.07
ORP (mV)	377	285	292	310	341
Salinity (PSU)	34.11	34.13	34.11	34.14	34.09
DO (mg/L)	7.68	7.73	7.67	6.78	7.14
Turbidity (NTU)	5.55	5.14	5.14	2.85	3.38
Total suspended solid (mg/L)	23.60	24.57	22.43	15.40	17.13
Dissolved organic carbon (mg/L)	2.59	2.64	2.61	1.75	1.82
Particulate organic carbon (mg/L)	1.80	2.09	1.87	0.23	0.12
≥ 50 μm organisms (inds./m^3)	197 667	167 501	154	86 945	0
≥ 10 - 50 μm organisms (inds./mL)	2 853	2 810	1	452	1
Heterotrophic bacteria (cells/mL)	50 500	76 812	0	6 634	0
Total coliform	TNTC*	TNTC	1	14	0
Escherichia coli	170	TNTC	1	22	0
Intestinal Enterococci	3	9	0	0	0
Toxicogenic *Vibrio cholerae* (O1, O139)	0	0	0	0	0

*TNTC, Too Numerous To Count

TEST RESULTS IN > 32 PSU (8th test cycle: 2011. 11. 09 - 2011. 11. 14)

Test Item	Ballasting			de-Ballasting	
	Test water	Control water	Treated water	Control water	Treated water
Water temperature (°C)	18.38	18.54	18.50	16.61	16.72
pH	8.24	8.37	8.43	8.05	8.11
ORP (mV)	367	305	314	325	339
Salinity (PSU)	33.23	33.53	33.24	33.41	33.04
DO (mg/L)	7.74	7.56	7.68	7.47	7.57
Turbidity (NTU)	3.48	3.55	4.06	2.14	2.58
Total suspended solid (mg/L)	16.10	18.57	18.37	13.00	13.87
Dissolved organic carbon (mg/L)	2.44	2.54	2.54	1.66	1.73
Particulate organic carbon (mg/L)	1.73	1.56	1.52	0.18	0.20
≥ 50 μm organisms (inds./m^3)	192 167	118 390	171	27 612	0
≥ 10 - 50 μm organisms (inds./mL)	1 620	1 492	259	353	1
Heterotrophic bacteria (cells/mL)	14 273	11 334	0	47 600	6
Total coliform	TNTC*	TNTC	1	4	0
Escherichia coli	10	19	0	0	0
Intestinal Enterococci	20	8	0	0	0
Toxicogenic *Vibrio cholerae* (O1, O139)	0	0	0	0	0

*TNTC, Too Numerous To Count

TEST RESULTS IN > 32 PSU (9th test cycle: 2011. 11. 16 - 2011. 11. 21)

Test Item	Ballasting			de-Ballasting	
	Test water	Control water	Treated water	Control water	Treated water
Water temperature (°C)	16.18	16.09	16.33	14.07	14.57
pH	8.36	8.33	8.33	8.06	7.95
ORP (mV)	332	313	308	282	310
Salinity (PSU)	34.09	34.08	34.10	34.10	33.90
DO (mg/L)	7.87	7.84	7.84	7.34	7.67
Turbidity (NTU)	4.72	5.02	4.76	3.48	2.71
Total suspended solid (mg/L)	18.50	18.90	18.57	13.40	15.70
Dissolved organic carbon (mg/L)	2.53	2.56	2.66	1.74	1.56
Particulate organic carbon (mg/L)	1.83	1.58	1.89	0.22	0.26
≥ 50 μm organisms (inds./m^3)	160 667	131 890	247	15 945	0
≥ 10 - 50 μm organisms (inds./mL)	2 211	2 045	388	653	1
Heterotrophic bacteria (cells/mL)	10 273	7 900	21	53 022	0
Total coliform	TNTC*	TNTC	8	0	0
Escherichia coli	53	7	0	0	0
Intestinal Enterococci	0	1	0	0	0
Toxicogenic *Vibrio cholerae* (O1, O139)	0	0	0	0	0

*TNTC, Too Numerous To Count

TEST RESULTS IN > 32 PSU (10th test cycle: 2011. 11. 23 - 2011. 11. 28)

Test Item	Ballasting			de-Ballasting	
	Test water	Control water	Treated water	Control water	Treated water
Water temperature (°C)	14.82	14.75	15.03	12.12	12.36
pH	8.33	8.37	8.39	8.18	8.12
ORP (mV)	266	271	255	339	352
Salinity (PSU)	33.97	34.01	34.00	34.00	33.82
DO (mg/L)	8.06	7.99	8.07	8.20	8.21
Turbidity (NTU)	4.17	4.22	4.07	4.01	3.40
Total suspended solid (mg/L)	18.80	17.53	19.07	17.13	17.53
Dissolved organic carbon (mg/L)	2.60	2.62	2.67	1.69	1.70
Particulate organic carbon (mg/L)	1.97	1.68	1.97	0.40	0.27
≥ 50 μm organisms (inds./m^3)	137 334	111 779	328	30 889	0
≥ 10 - 50 μm organisms (inds./mL)	2 931	2 345	568	1 501	7
Heterotrophic bacteria (cells/mL)	25 273	16 612	0	16 623	0
Total coliform	TNTC*	TNTC	8	0	2
Escherichia coli	173	20	1	0	1
Intestinal Enterococci	13	1	0	0	0
Toxicogenic *Vibrio cholerae* (O1, O139)	0	0	0	0	0

*TNTC, Too Numerous To Count

TEST RESULTS IN > 32 PSU (11th* test cycle: 2011. 12. 07 - 2011. 12. 12)

Test Item	Ballasting			de-Ballasting	
	Test water	Control water	Treated water	Control water	Treated water
Water temperature (°C)	13.32	12.88	13.21	8.99	9.02
pH	8.18	8.38	8.39	8.23	8.15
ORP (mV)	360	307	316	288	320
Salinity (PSU)	34.01	34.21	34.20	34.17	34.16
DO (mg/L)	8.30	8.33	8.31	8.88	8.89
Turbidity (NTU)	122.00	130.33	131.33	84.60	36.90
Total suspended solid (mg/L)	267.70	281.57	260.63	232.80	122.67
Dissolved organic carbon (mg/L)	1.55	2.60	2.50	1.51	1.63
Particulate organic carbon (mg/L)	1.75	2.07	1.97	0.84	0.34
≥ 50 μm organisms (inds./m^3)	131 000	109 778	3	22 278	0
≥ 10 - 50 μm organisms (inds./mL)	2 623	1 994	135	633	3
Heterotrophic bacteria (cells/mL)	11 773	14 322	3	0	0
Total coliform	TNTC**	TNTC	0	0	0
Escherichia coli	0	0	0	0	0
Intestinal Enterococci	0	0	0	0	0
Toxicogenic *Vibrio cholerae* (O1, O139)	0	0	0	0	0

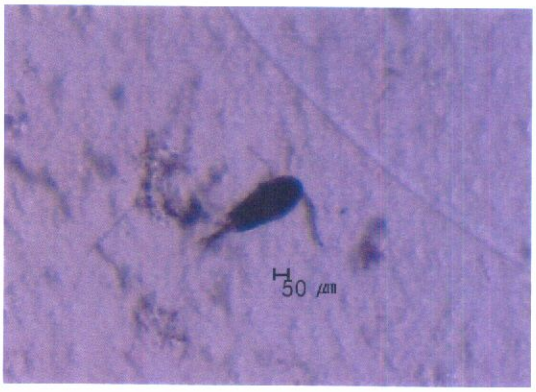
*11th testing was carried out under higher turbidity (> 100 NTU) than other test cycle.
**TNTC, Too Numerous To Count

IV. ANALYZED SAMPLE PICTURES

1. ≥ 50 μm organisms

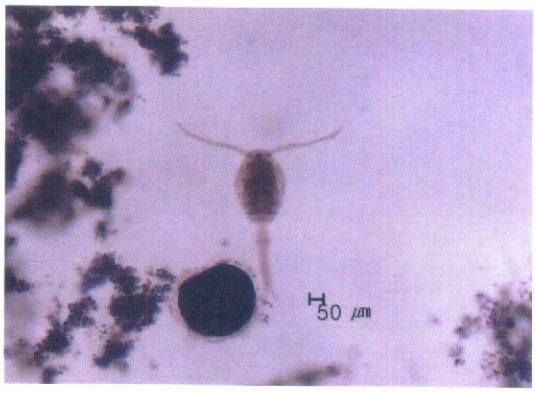
· **Ballasting (1st test cycle: 2011. 09. 01)**

Artemia salina (Test water)

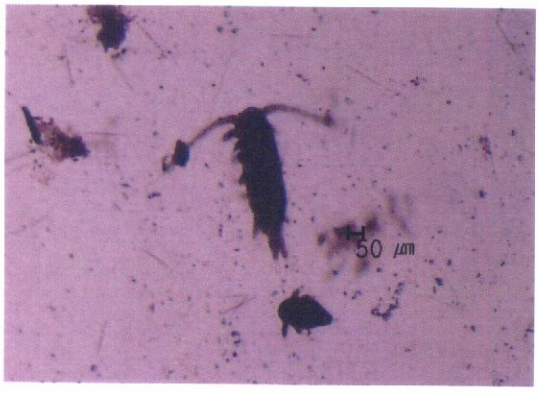


Copepodite (Test water)

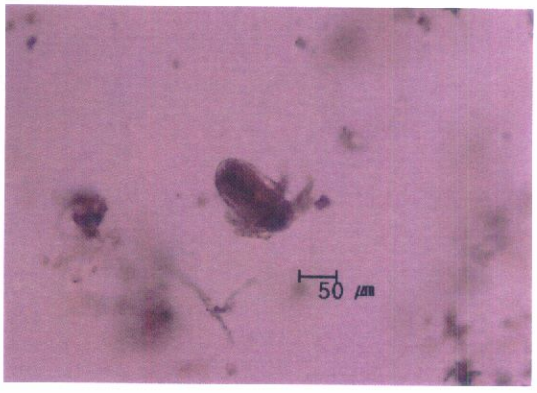
Copepod nauplius (Test water)



Oithona sp. (Test water)



Copepodite (Test water)

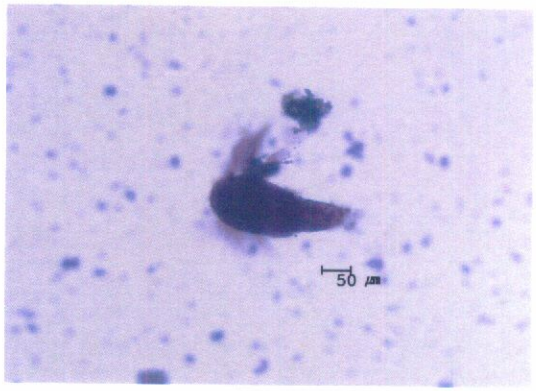


Copepod nauplius (Test water)

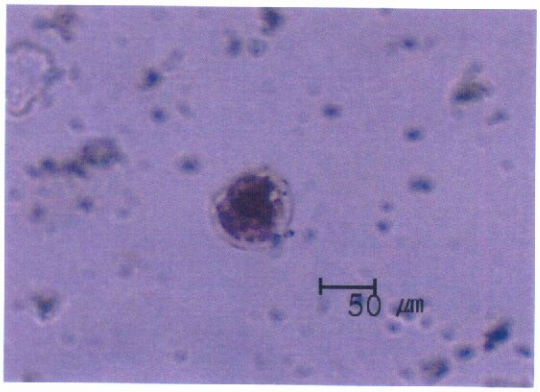
1. To be continued

· **Ballasting (1st test cycle: 2011. 09. 01)**

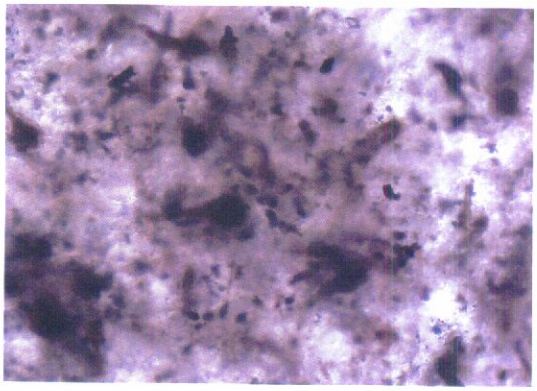
Artemia salina (Control water)



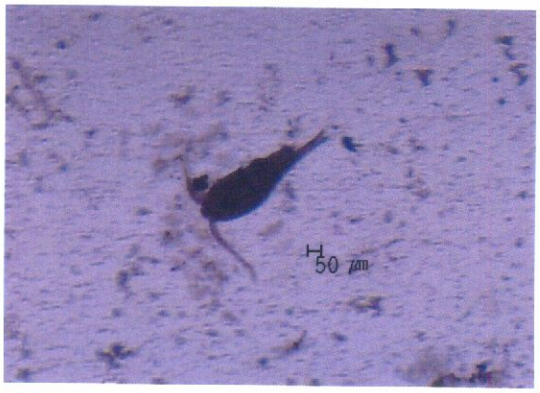
Copepod nauplius (Viable, Treated water)



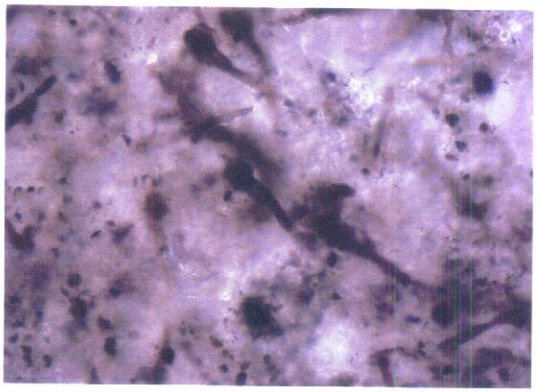
Bivalve larva (Control water)



Debris (Treated water)



Oithona sp. (Control water)



Debris (Treated water)

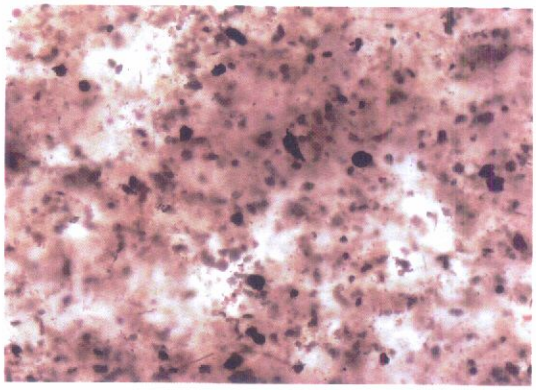
1. To be continued

· de-Ballasting (1st test cycle: 2011. 09. 06)

Artemia salina (Control water)

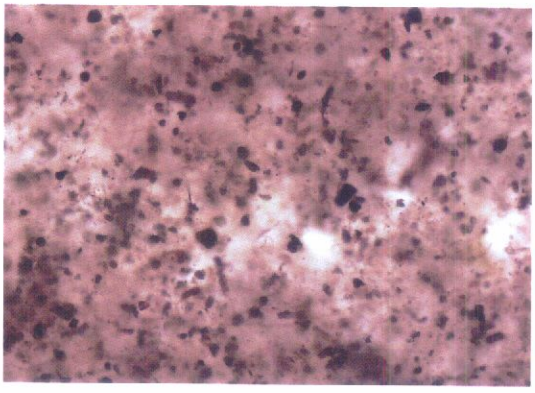
Artemia salina (Viable, Treated water)

Oithona sp. (Control water)



Debris (Treated water)

Artemia salina (Control water)



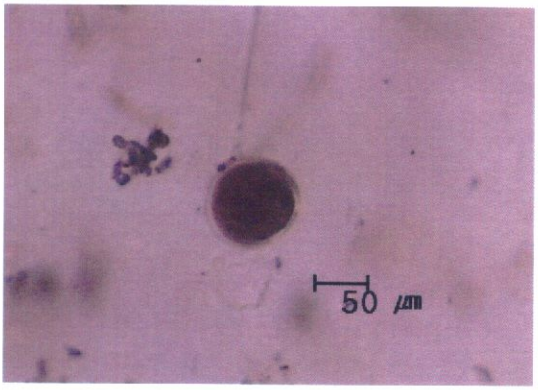
Debris (Treated water)

1. To be continued

· Ballasting (2nd test cycle: 2011. 09. 28)

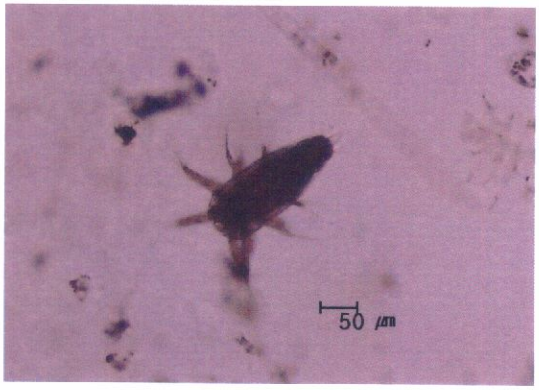
Oithona sp. (Test water)

Artemia salina (Test water)



Bivalve larva (Test water)

Artemia salina (Test water)



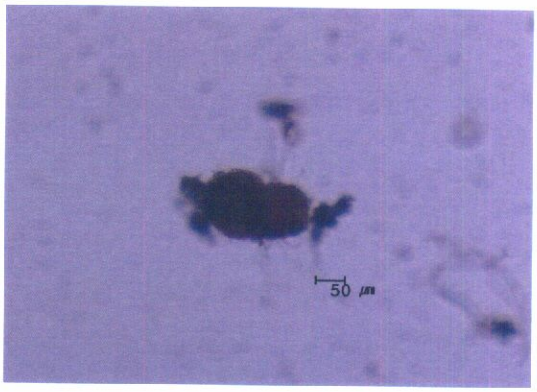
Copepod nauplius (Test water)

Copepod nauplius (Test water)

1. To be continued

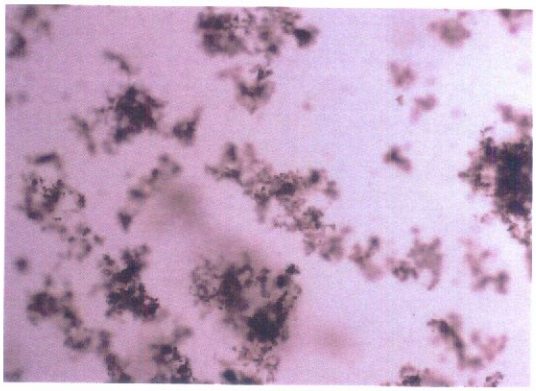
· **Ballasting (2nd test cycle: 2011. 09. 28)**

Artemia salina (Control water)

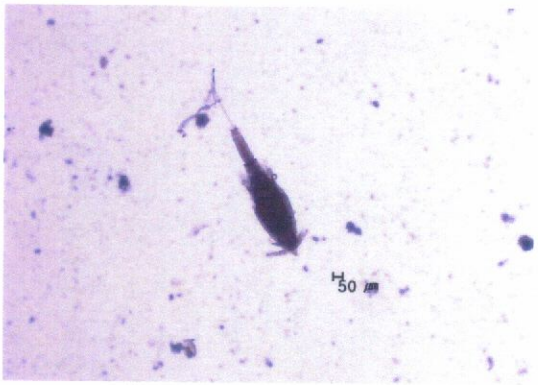


Polychaeta larva (Viable, Treated water)

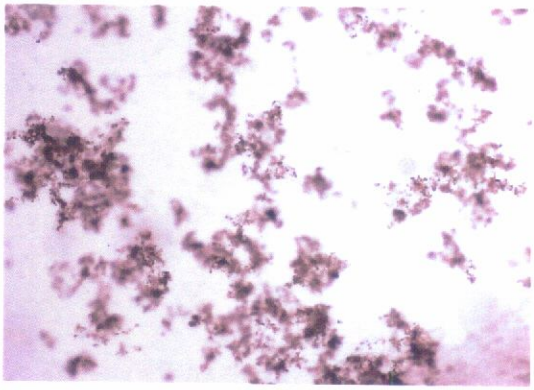
Copepod nauplius (Control water)



Debris (Treated water)



Harpacticoida (Control water)

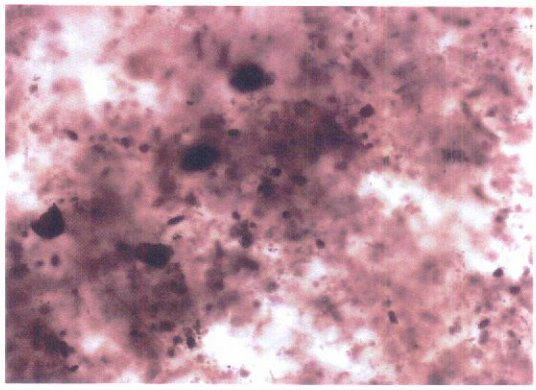


Debris (Treated water)

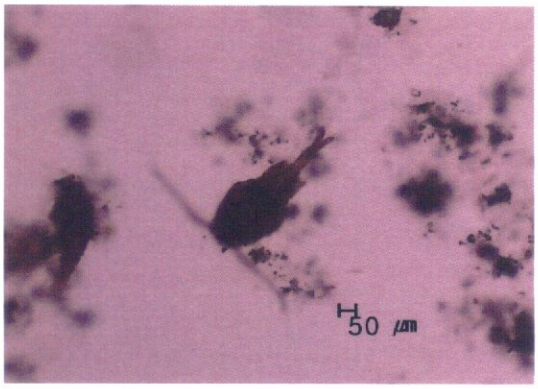
1. To be continued

· de-Ballasting (2nd test cycle: 2011. 10. 03)

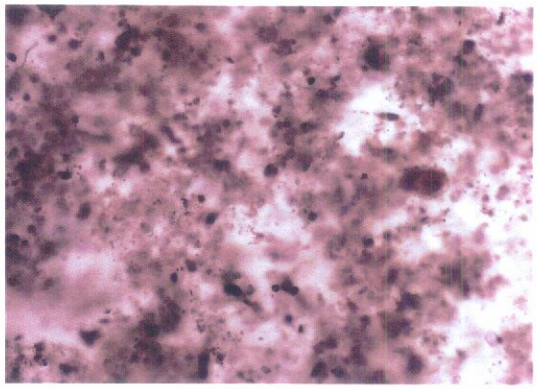
Artemia salina (Control water)



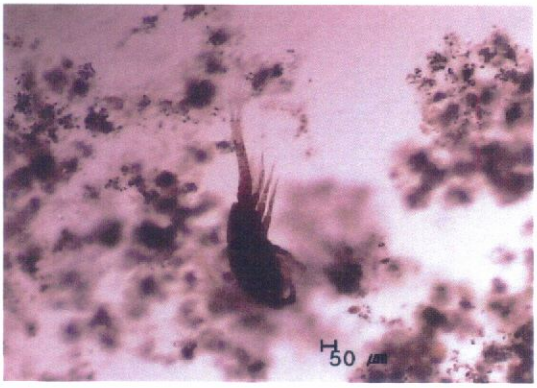
Debris (Treated water)



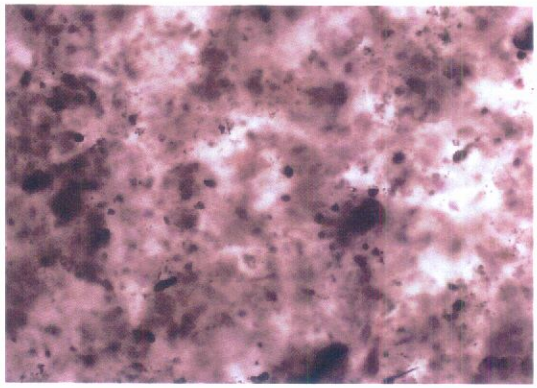
Oithona sp. (Control water)



Debris (Treated water)



Oithona sp. (Control water)



Debris (Treated water)

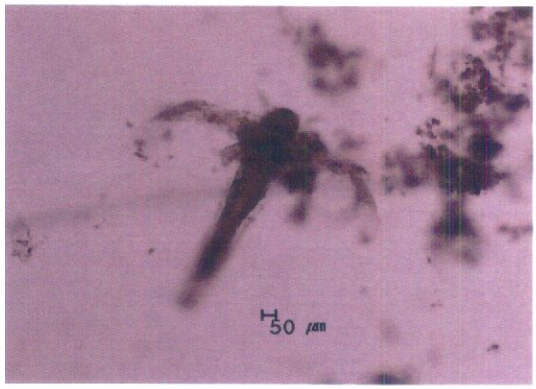
1. To be continued

· Ballasting (3rd test cycle: 2011. 10. 05)

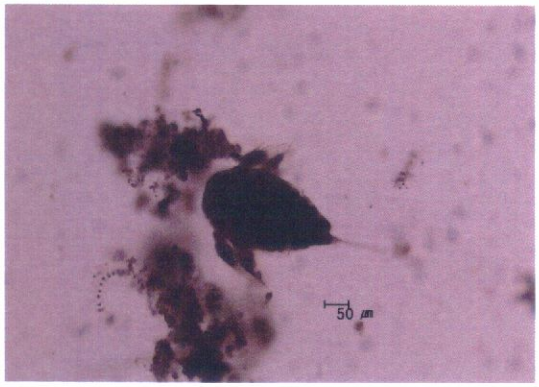
Harpacticoida (Test water)

Oithona sp. (Test water)

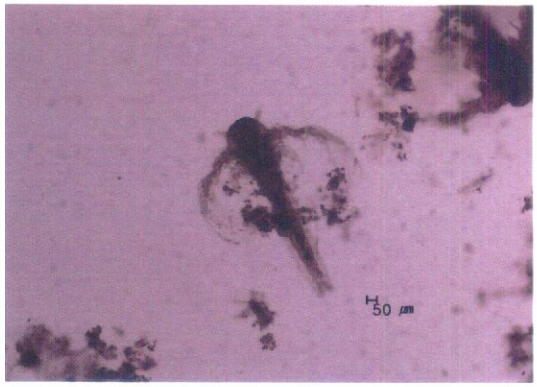
Copepodite (Test water)



Artemia salina (Test water)



Copepod nauplius (Test water)



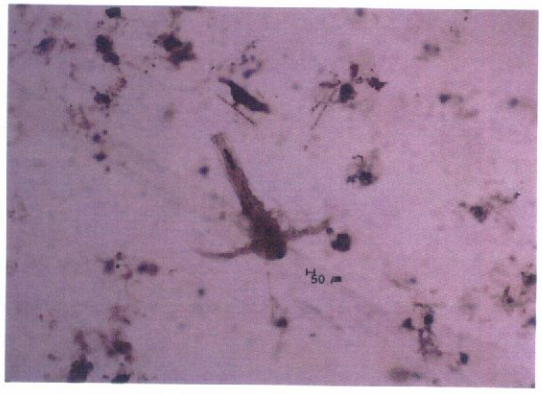
Artemia salina (Test water)

1. To be continued

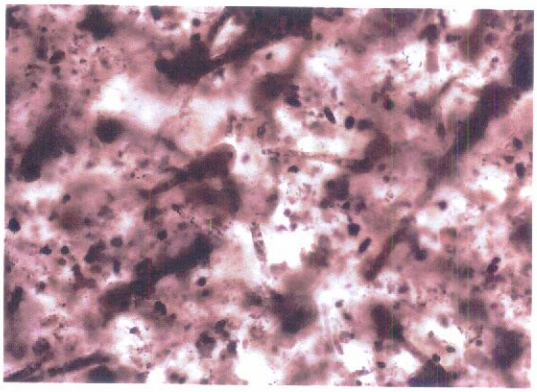
· Ballasting (3rd test cycle: 2011. 10. 05)

Copepodite (Control water)

Artemia salina (Viable, Treated water)

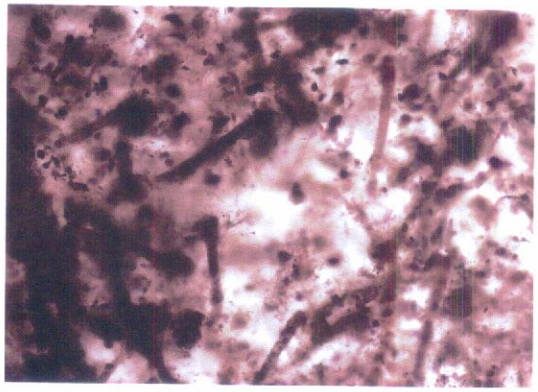


Artemia salina (Control water)



Debris (Treated water)

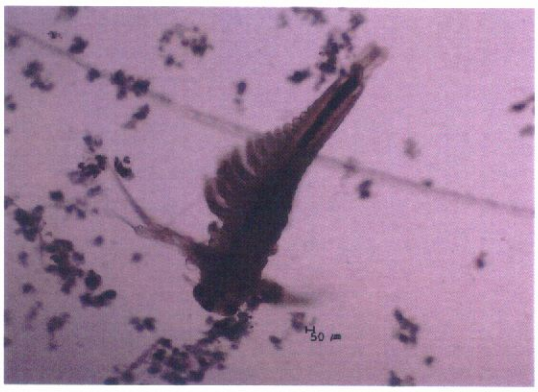
Copepodite (Control water)



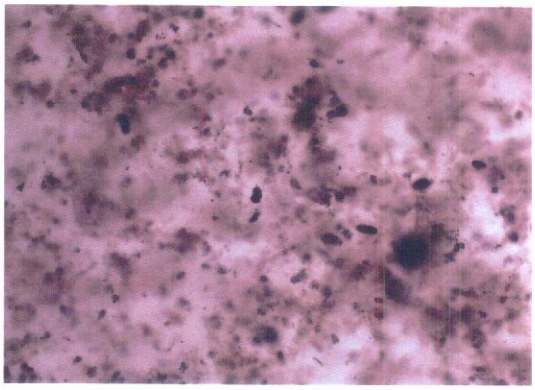
Debris (Treated water)

1. To be continued

· **de-Ballasting (3rd test cycle: 2011. 10. 10)**

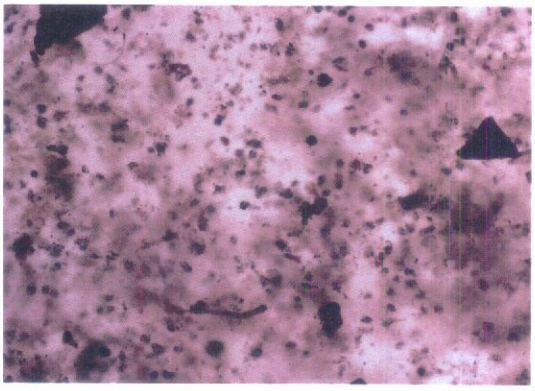


Artemia salina (Control water)



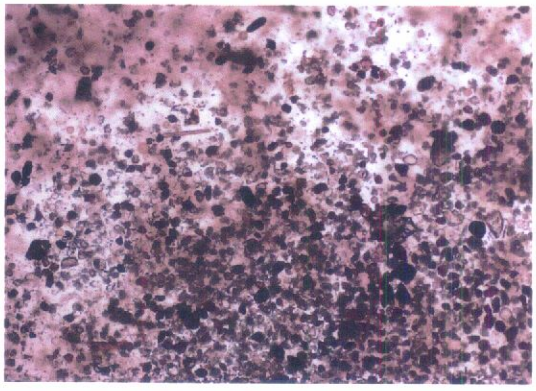
Debris (Treated water)

Artemia salina (Control water)



Debris (Treated water)

Artemia salina (Control water)

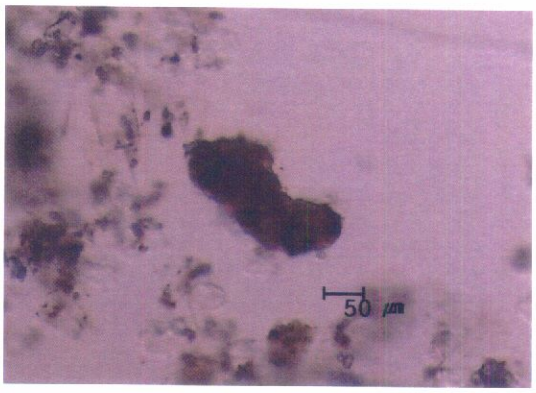


Debris (Treated water)

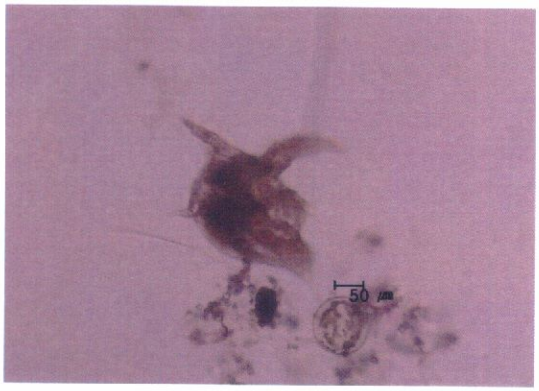
1. To be continued

· Ballasting (4th test cycle: 2011. 10. 12)

Artemia salina (Test water)

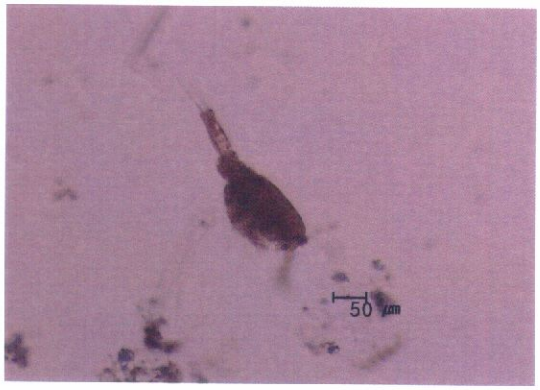


Polychaeta larva (Test water)

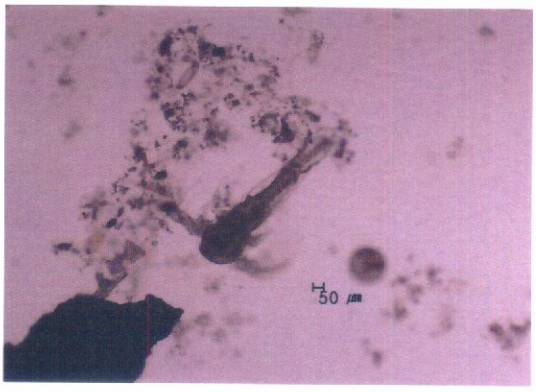


Balanus larva (Test water)

Copepod nauplius (Test water)



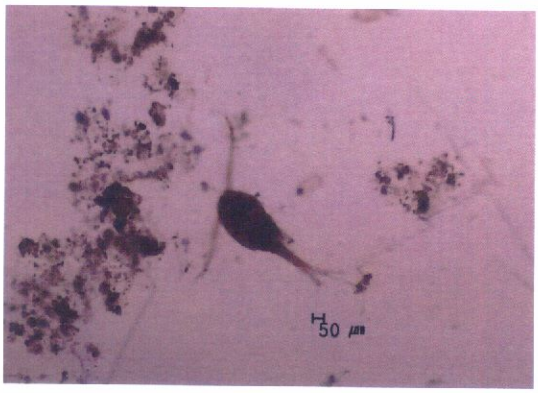
Copepodite (Test water)



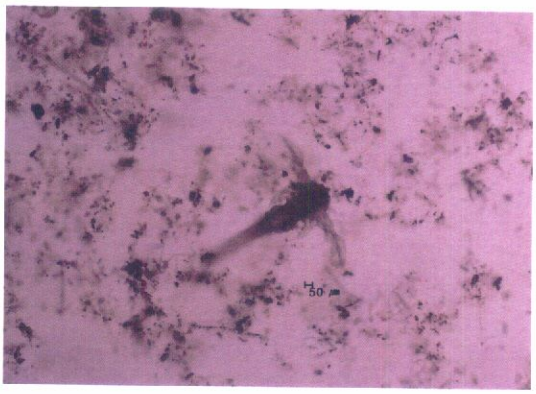
Artemia salina (Test water)

1. To be continued

· Ballasting (4th test cycle: 2011. 10. 12)

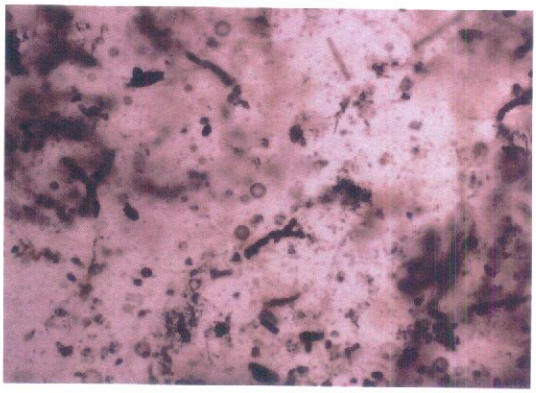


Oithona sp. (Control water)



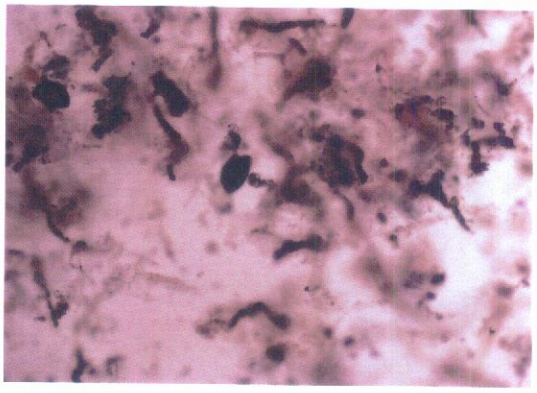
Artemia salina (Viable, Treated water)

Artemia salina (Control water)



Debris (Treated water)

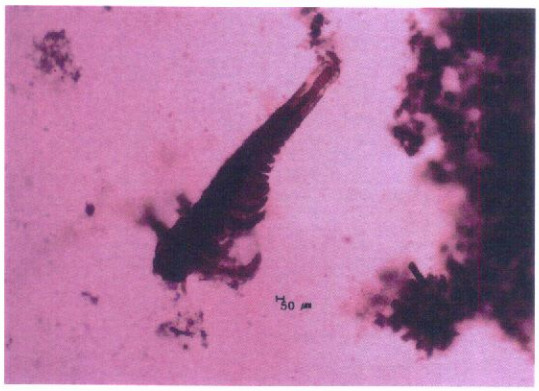
Oithona sp. (Control water)



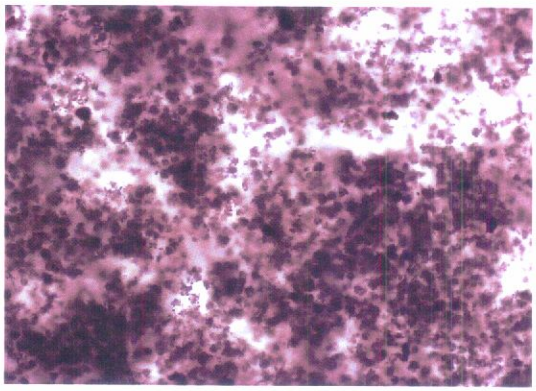
Debris (Treated water)

1. To be continued

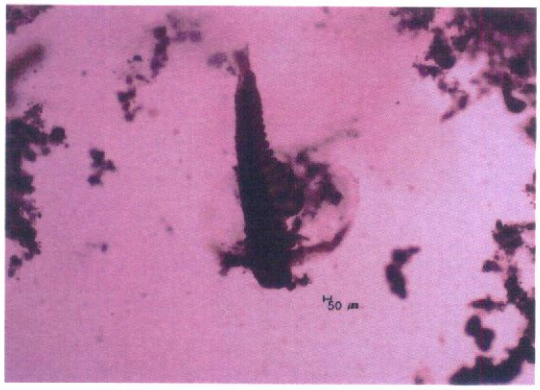
· de-Ballasting (4th test cycle: 2011. 10. 17)



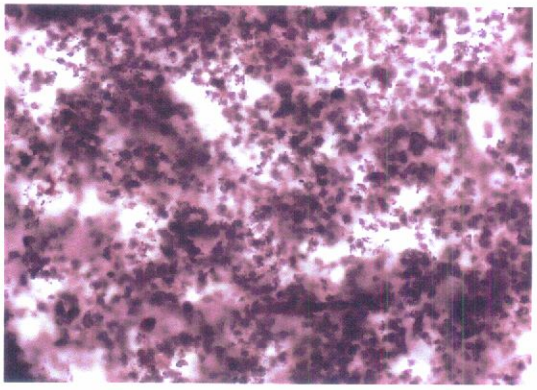
Artemia salina (Control water)



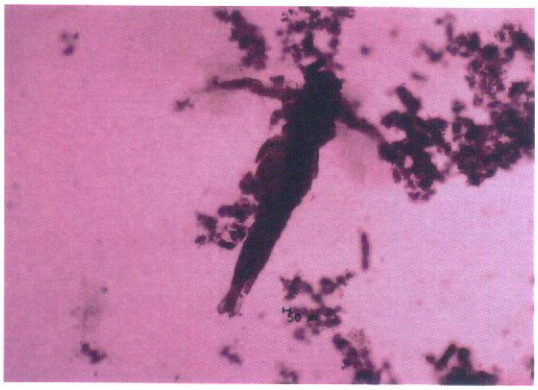
Debris (Treated water)



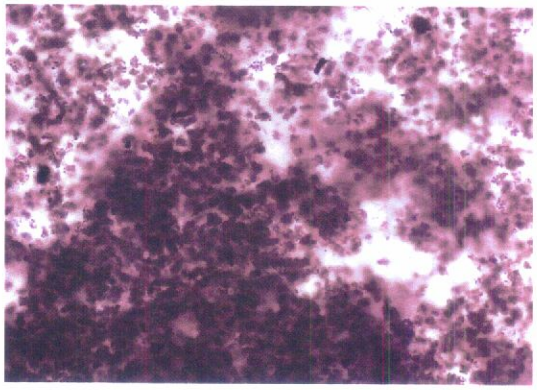
Artemia salina (Control water)



Debris (Treated water)



Artemia salina (Control water)



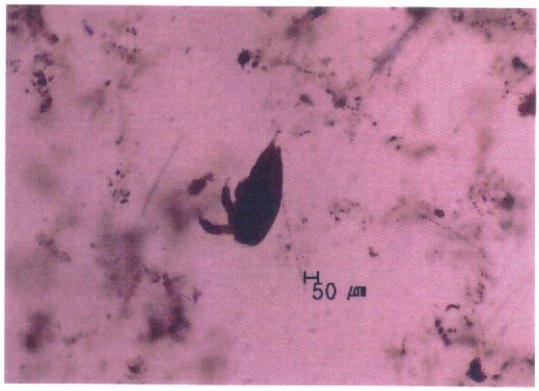
Debris (Treated water)

1. To be continued

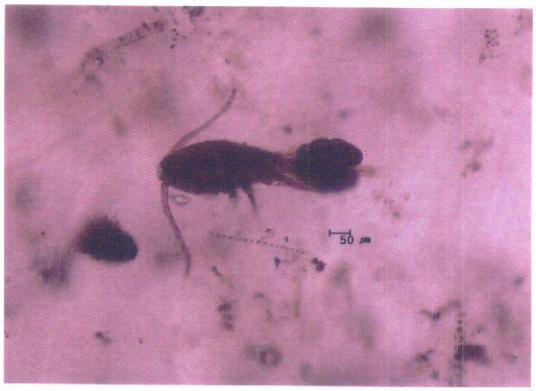
· Ballasting (5th test cycle: 2011. 10. 19)

Artemia salina (Test water)

Artemia salina (Test water)



Copepod nauplius (Test water)



Oithona sp. (Test water)

Tintinnopsis sp. (Test water)

Copepodite (Test water)

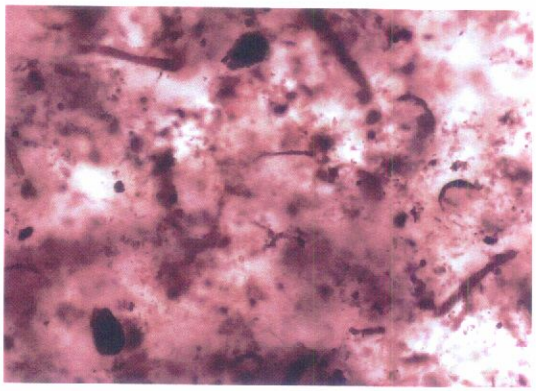
1. To be continued

· Ballasting (5th test cycle: 2011. 10. 19)

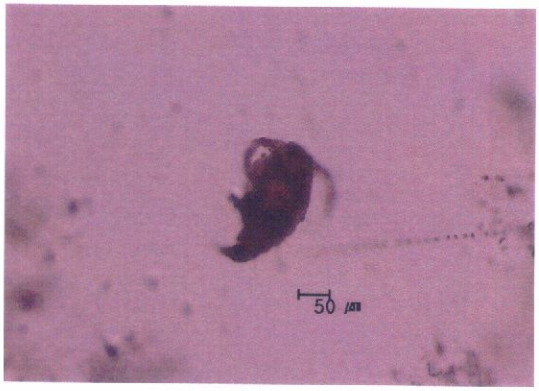
Artemia salina (Control water)

Polychaeta larva (Viable, Treated water)

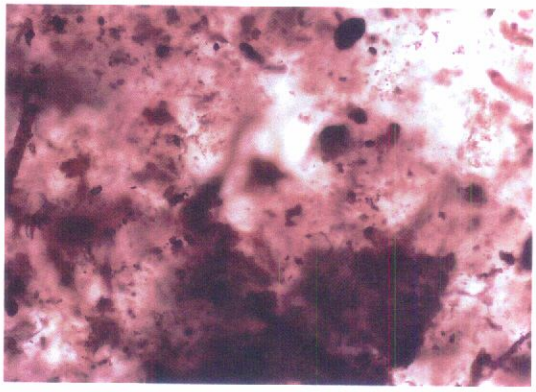
Balanus larva (Control water)



Debris (Treated water)



Copepodite (Control water)

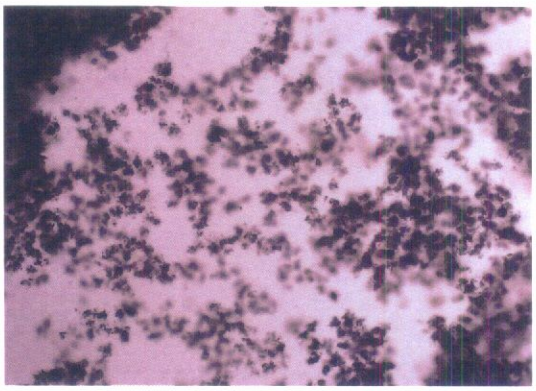


Debris (Treated water)

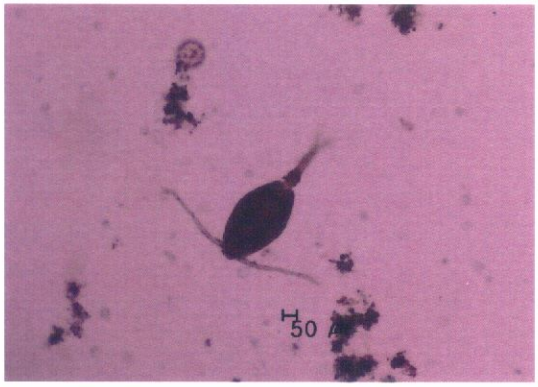
1. To be continued

· **de-Ballasting (5th test cycle: 2011. 10. 24)**

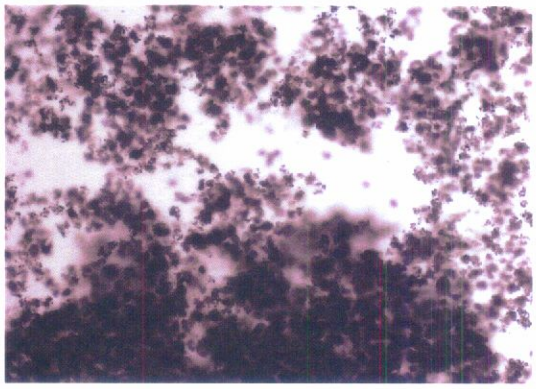
Artemia salina (Control water)



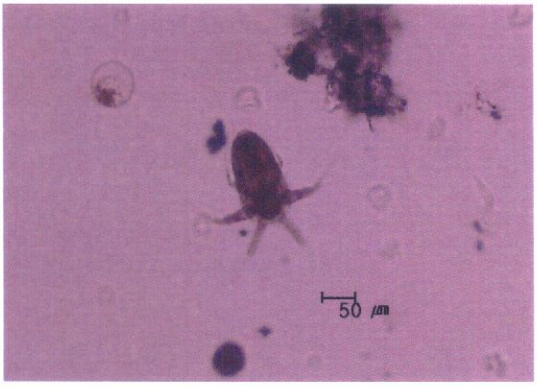
Debris (Treated water)



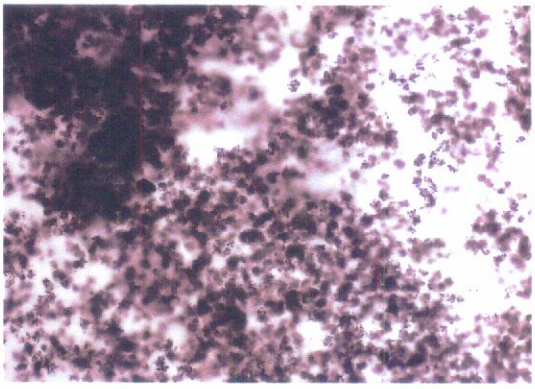
Oithona sp. (Control water)



Debris (Treated water)



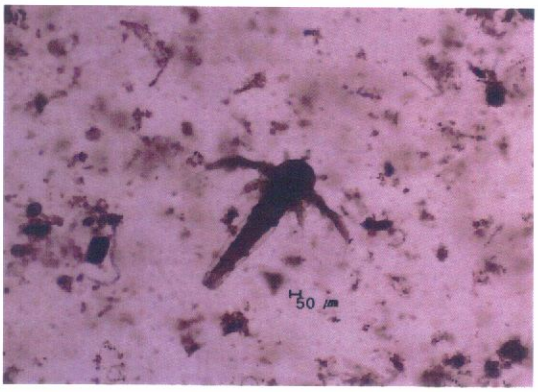
Copepod nauplius (Control water)



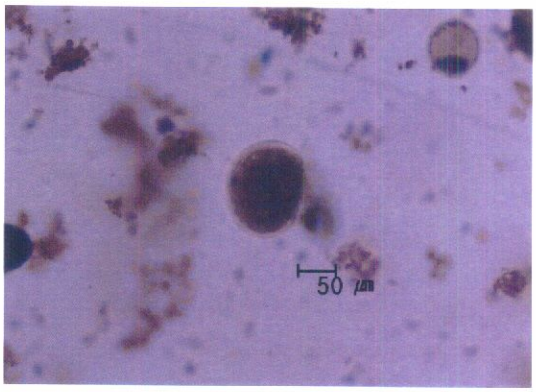
Debris (Treated water)

1. To be continued

· Ballasting (6th test cycle: 2011. 10. 26)



Artemia salina (Test water)



Bivalve larva (Test water)

Oithona sp. (Test water)

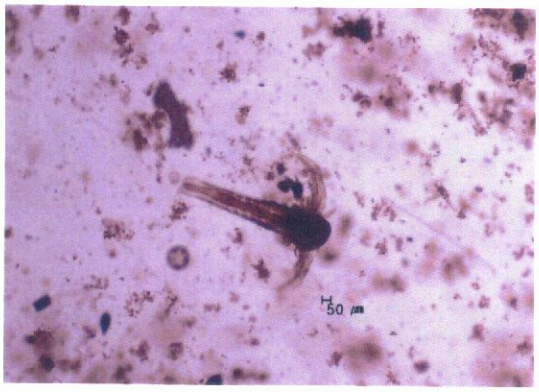
Balanus larva (Test water)

Copepod nauplius (Test water)

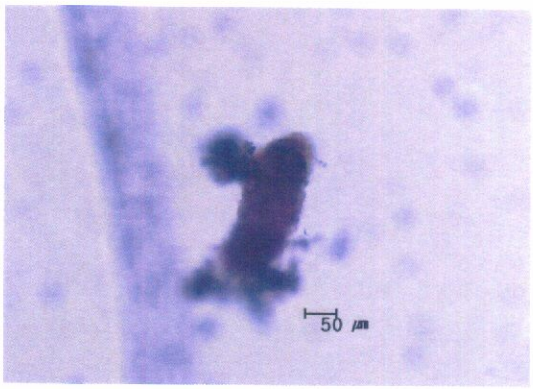
Copepodite (Test water)

1. To be continued

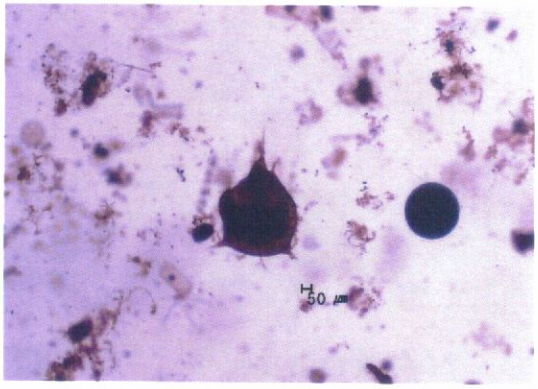
· **Ballasting (6th test cycle: 2011. 10. 26)**



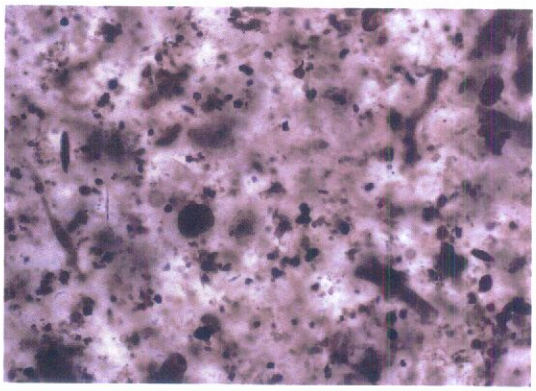
Artemia salina (Control water)



Polychaeta larva (Viable, Treated water)

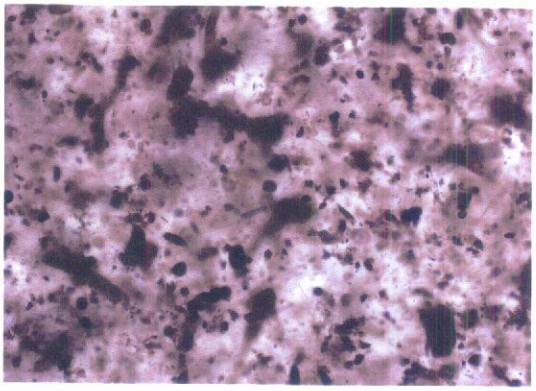


Balanus larva (Control water)



Debris (Treated water)

Oithona sp. (Control water)

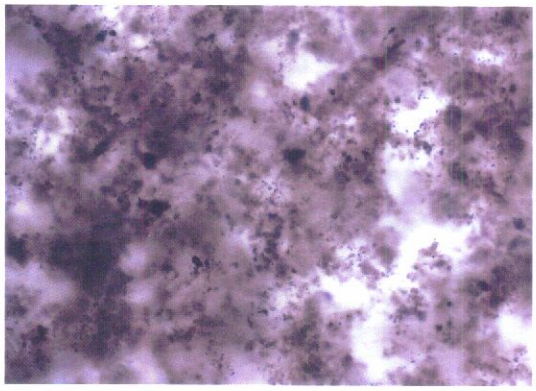


Debris (Treated water)

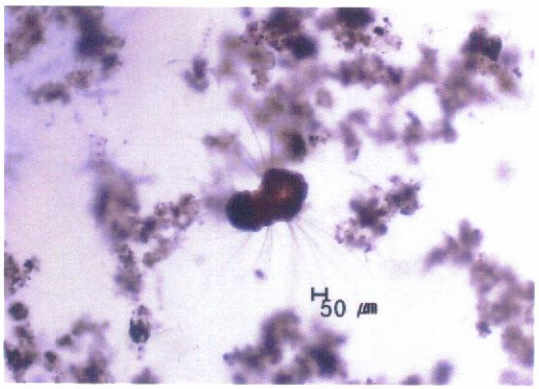
1. To be continued

· de-Ballasting (6th test cycle: 2011. 10. 31)

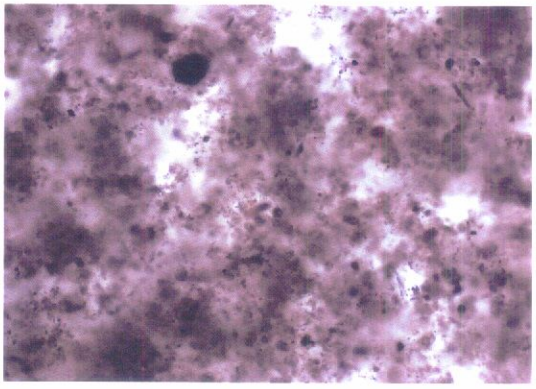
Artemia salina (Control water)



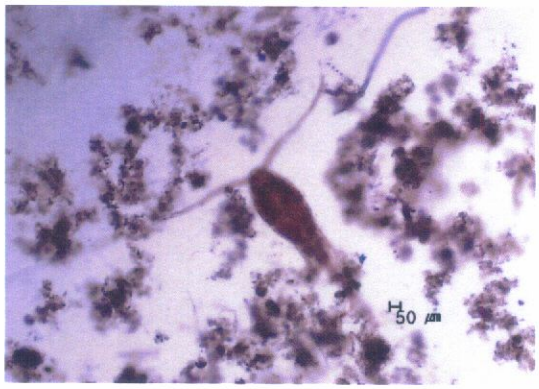
Debris (Treated water)



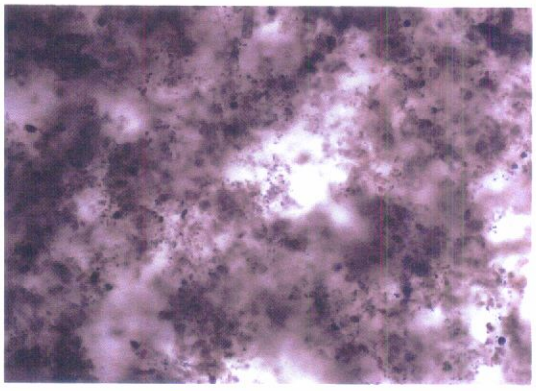
Polychaeta larva (Control water)



Debris (Treated water)



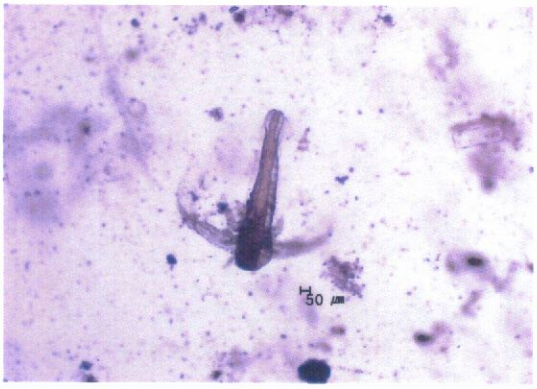
Oithona sp. (Control water)



Debris (Treated water)

1. To be continued

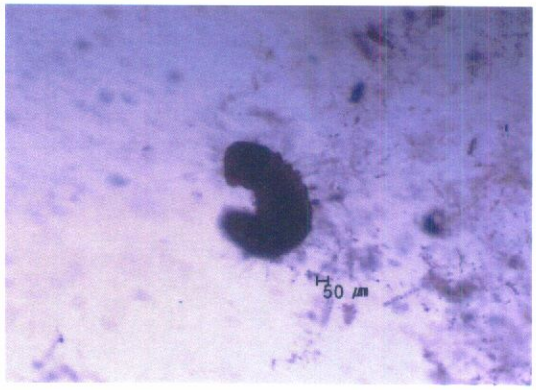
· Ballasting (7th test cycle: 2011. 11. 02)



Artemia salina (Test water)

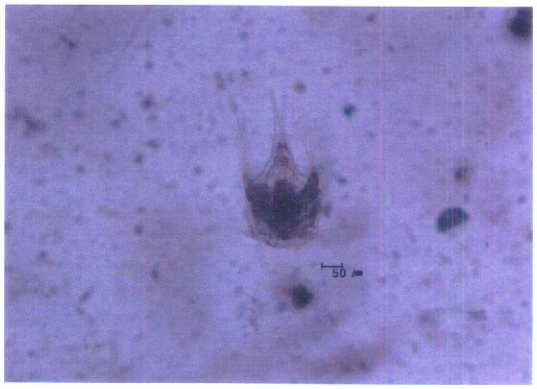
Copepod nauplius (Test water)

Copepodite (Test water)



Polychaet larva (Test water)

Copepod nauplius (Test water)

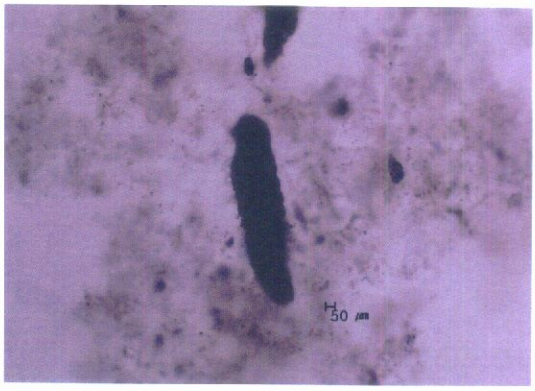


Balanus larva (Test water)

1. To be continued

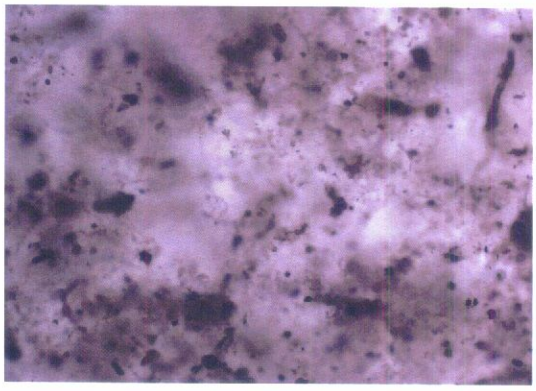
· Ballasting (7th test cycle: 2011. 11. 02)

Artemia salina (Control water)



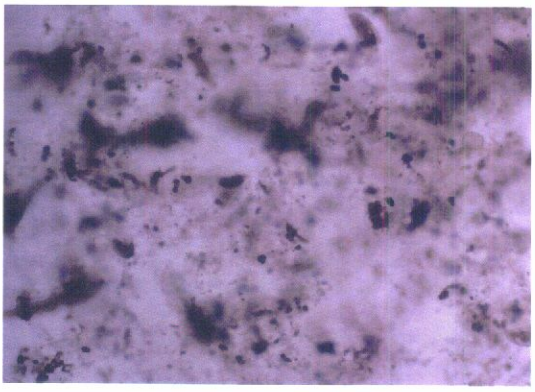
Polychaeta larva (Viable, Treated water)

Copepod nauplius (Control water)



Debris (Treated water)

Copepodite (Control water)

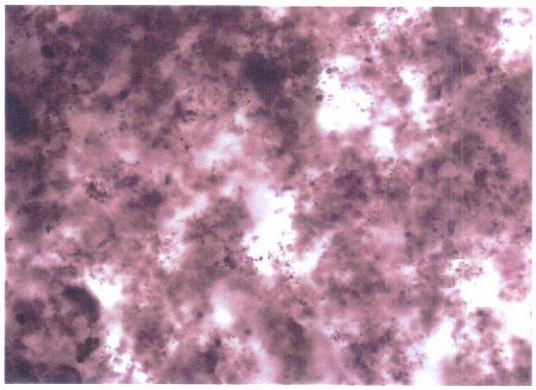


Debris (Treated water)

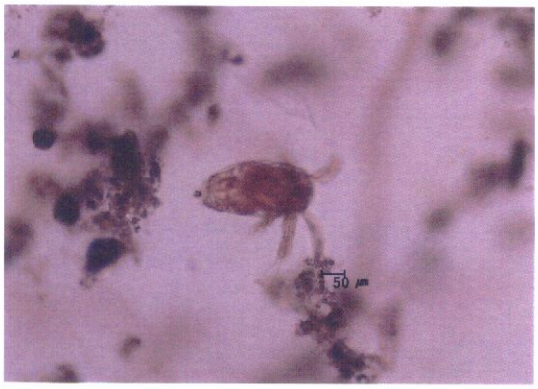
1. To be continued

· de-Ballasting (7th test cycle: 2011. 11. 07)

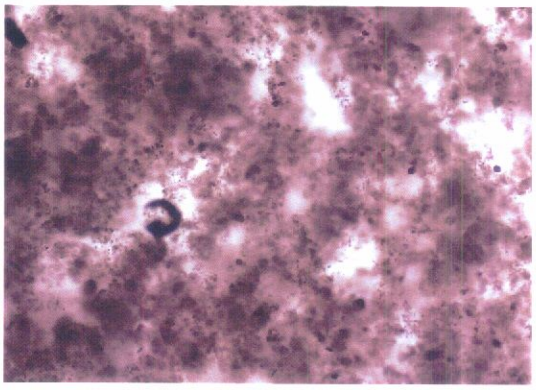
Eurytemora affinis (Control water)



Debris (Treated water)

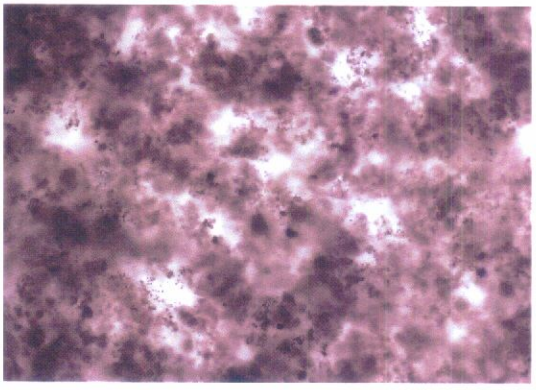


Copepod nauplius (Control water)



Debris (Treated water)

Oithona sp. (Control water)



Debris (Treated water)

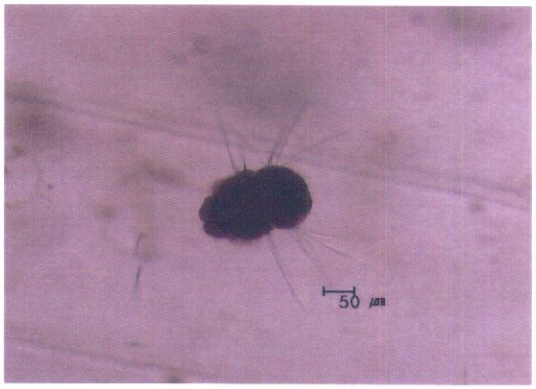
1. To be continued

· **Ballasting (8th test cycle: 2011. 11. 09)**

Artemia salina (Test water)

Copepod nauplius (Test water)

Paracalanus sp. (Test water)



Polychaeta larva (Test water)

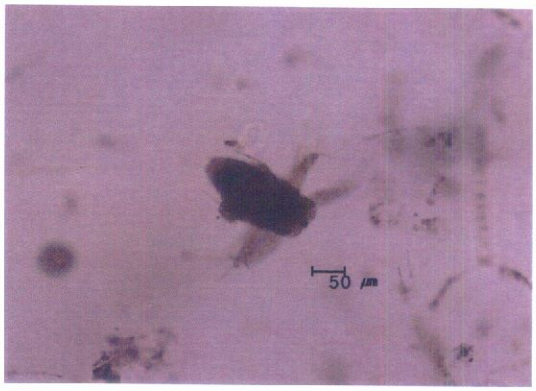
Balanus larva (Test water)

Oithona sp. (Test water)

1. To be continued

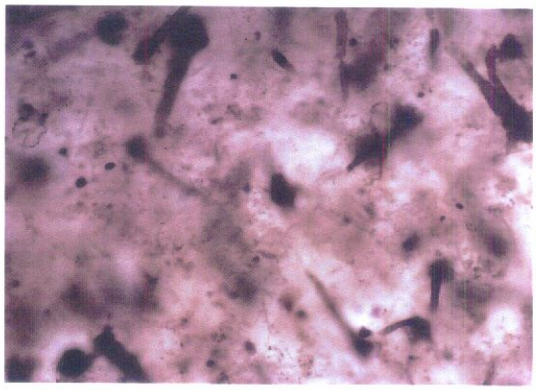
· Ballasting (8th test cycle: 2011. 11. 09)

Artemia salina (Control water)



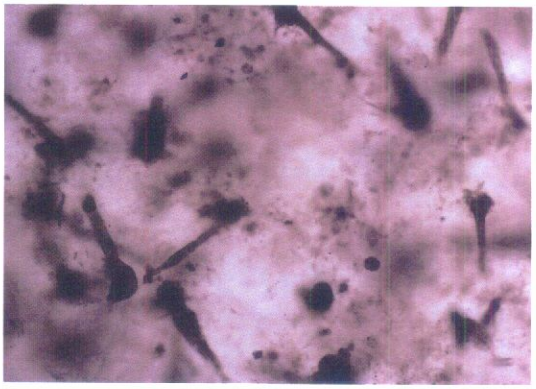
Copepod nauplius (Viable, Treated water)

Copepod nauplius (Control water)



Debris (Treated water)

Polychaeta larva (Control water)

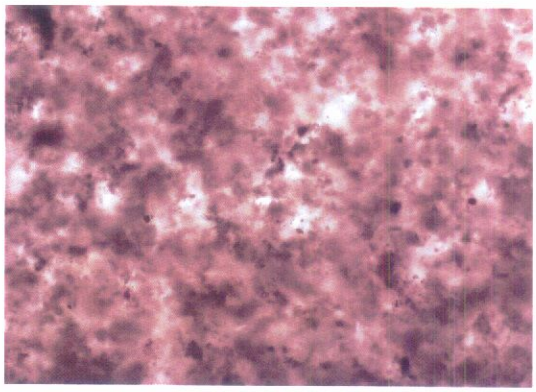


Debris (Treated water)

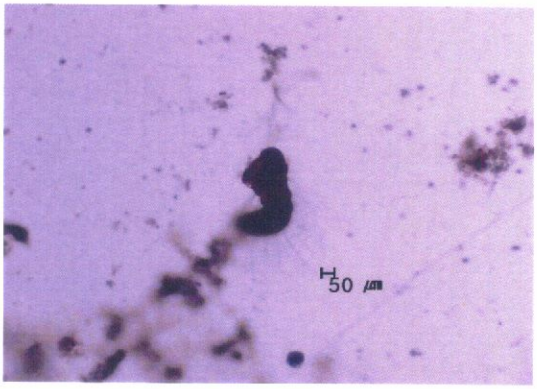
1. To be continued

· de-Ballasting (8th test cycle: 2011. 11. 14)

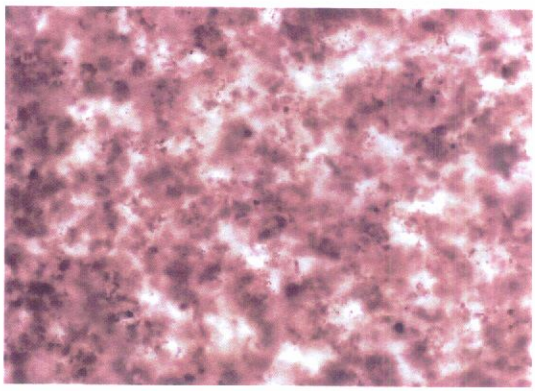
Oithona sp. (Control water)



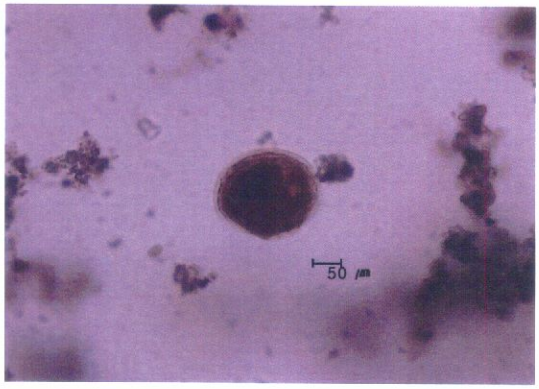
Debris (Treated water)



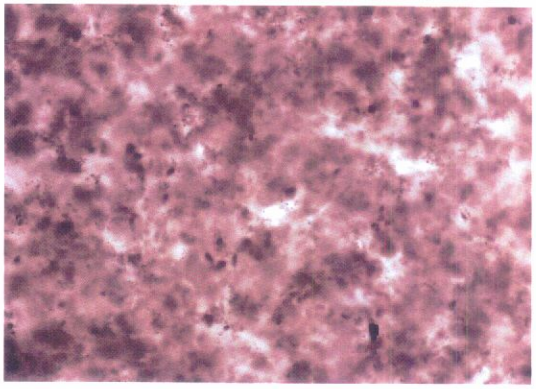
Polychaeta larva (Control water)



Debris (Treated water)



Bivalve larva (Control water)



Debris (Treated water)

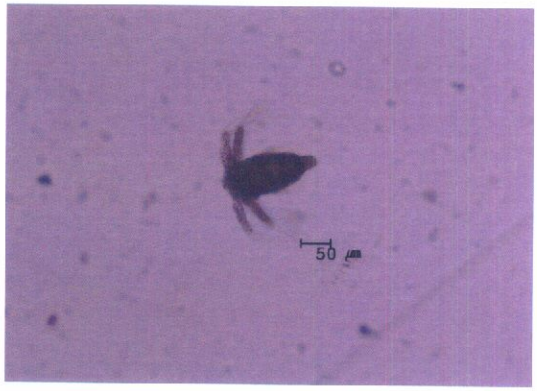
1. To be continued

· Ballasting (9th test cycle: 2011. 11. 16)

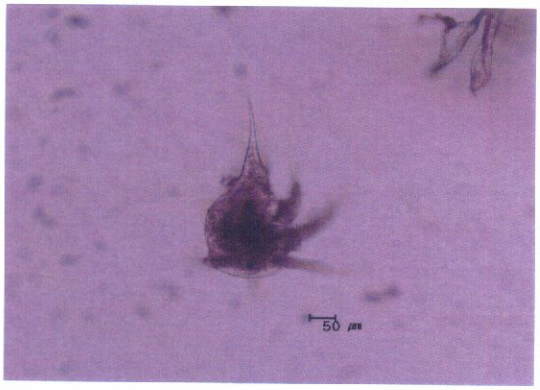
Artemia salina (Test water)

Oithona sp. (Test water)

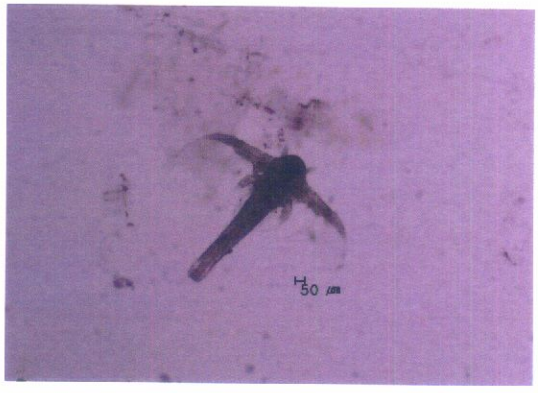
Polychaeta larva (Test water)



Copepod nauplius (Test water)



Balanus larva (Test water)



Artemia salina (Test water)

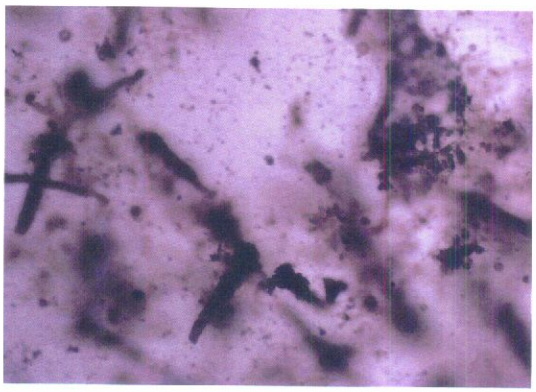
1. To be continued

· **Ballasting (9th test cycle: 2011. 11. 16)**

Polychaeta larva (Control water)

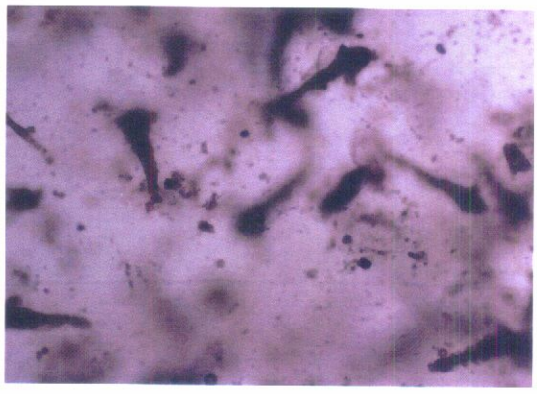
Copepodite (Viable, Treated water)

Oithona sp. (Control water)



Debris (Treated water)

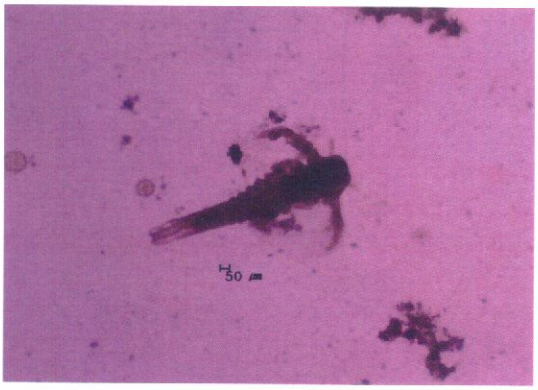
Artemia salina (Control water)



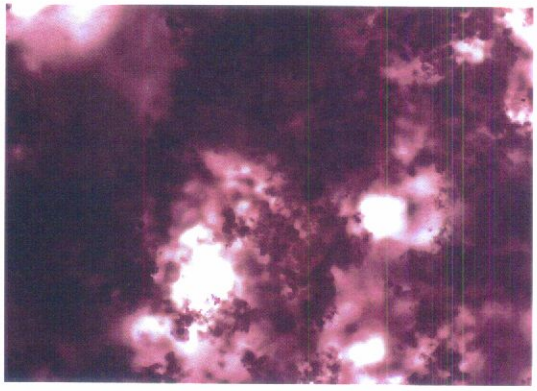
Debris (Treated water)

1. To be continued

· de-Ballasting (9th test cycle: 2011. 11. 21)

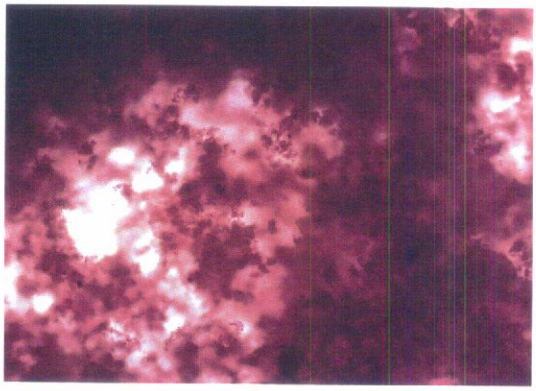


Artemia salina (Control water)



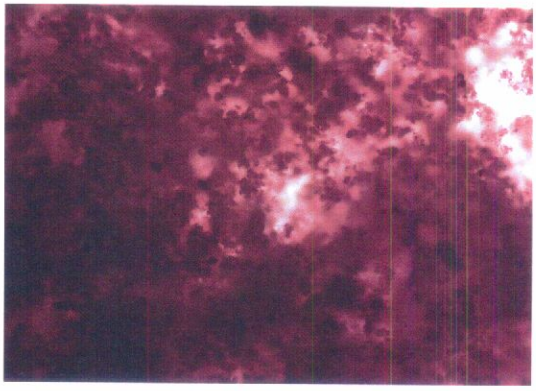
Debris (Treated water)

Copepod nauplius (Control water)



Debris (Treated water)

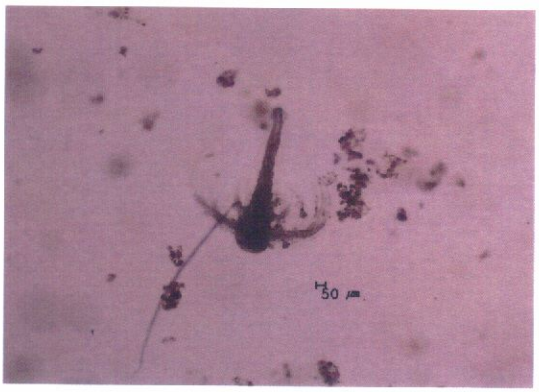
Paracalanus sp. (Control water)



Debris (Treated water)

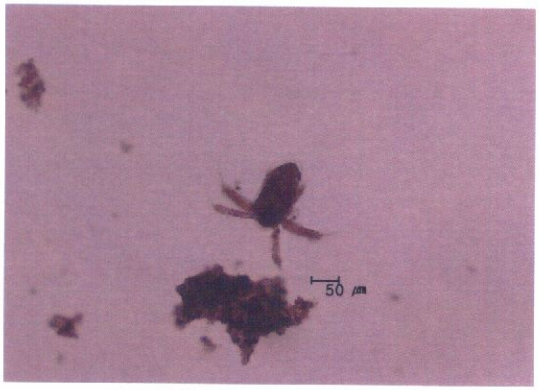
1. To be continued

· Ballasting (10th test cycle: 2011. 11. 23)



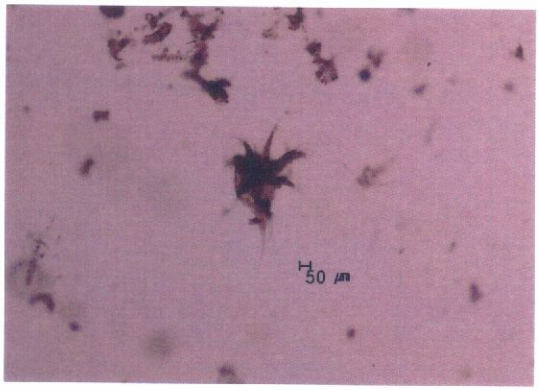
Artemia salina (Test water)

Harpacticoida (Test water)

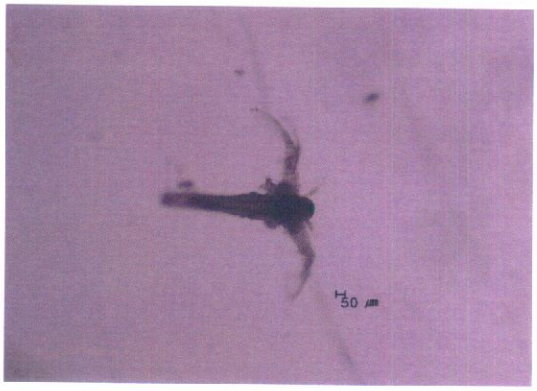


Copepod nauplius (Test water)

Copepodite (Test water)



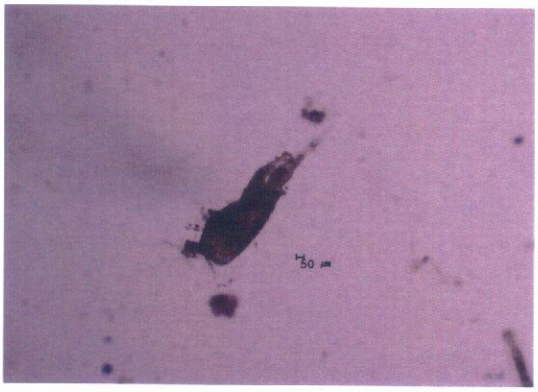
Balanus larva (Test water)



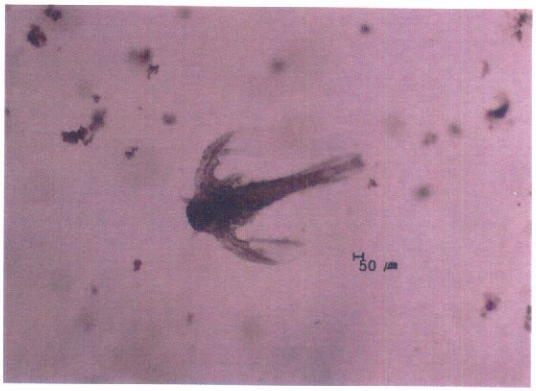
Artemia salina (Test water)

1. To be continued

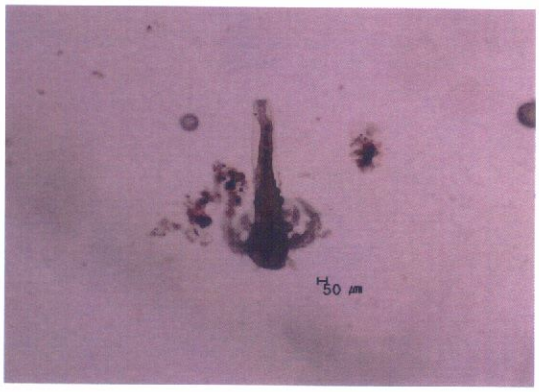
· Ballasting (10th test cycle: 2011. 11. 23)



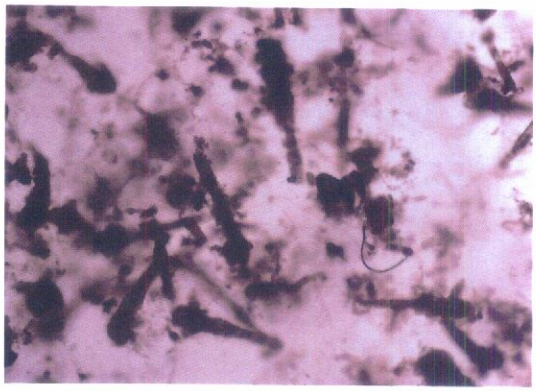
Corycaeus affinis (Control water)



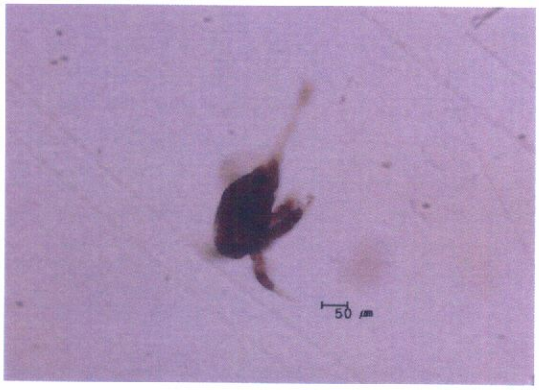
Artemia salina (Viable, Treated water)



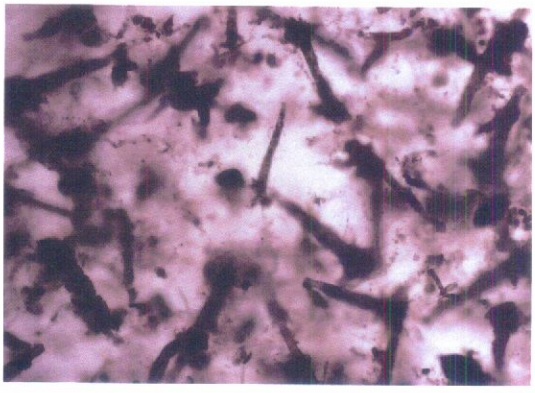
Artemia salina (Control water)



Debris (Treated water)



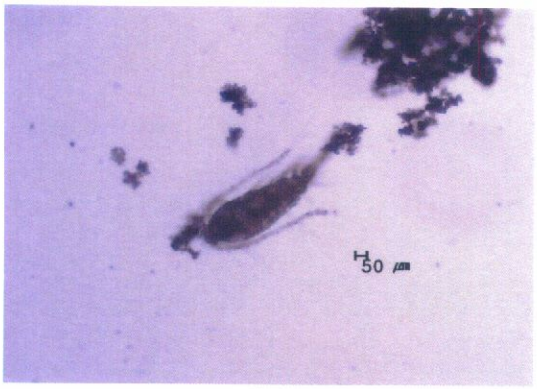
Copepod nauplius (Control water)



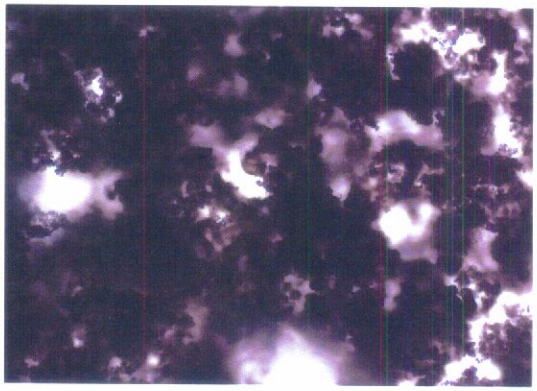
Debris (Treated water)

1. To be continued

· de-Ballasting (10th test cycle: 2011. 11. 28)

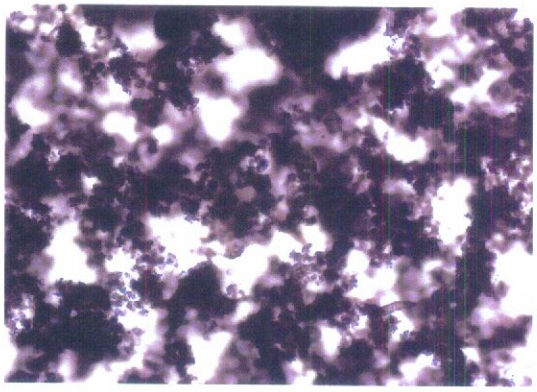


Oithona sp. (Control water)



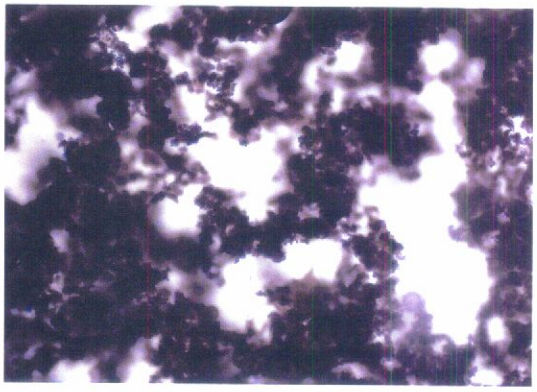
Debris (Treated water)

Artemia salina (Control water)



Debris (Treated water)

Copepod nauplius (Control water)

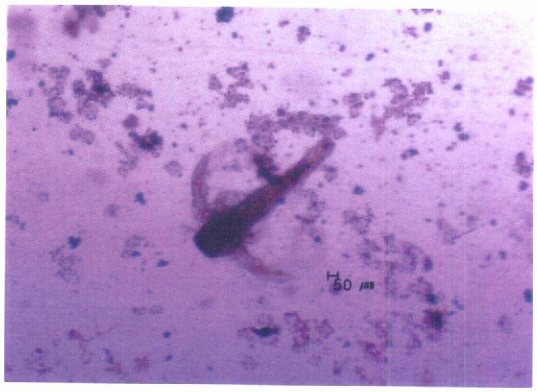


Debris (Treated water)

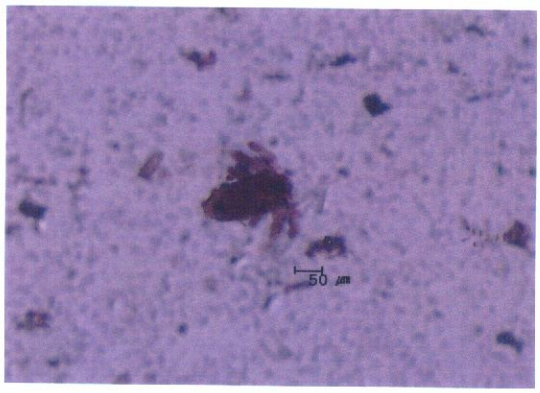
1. To be continued

· Ballasting (11th test cycle: 2011. 12. 07)

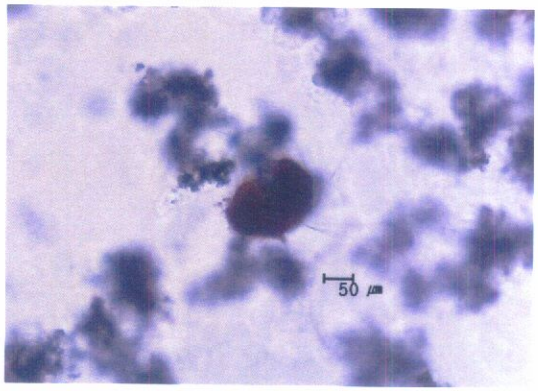
Artemia salina (Test water)



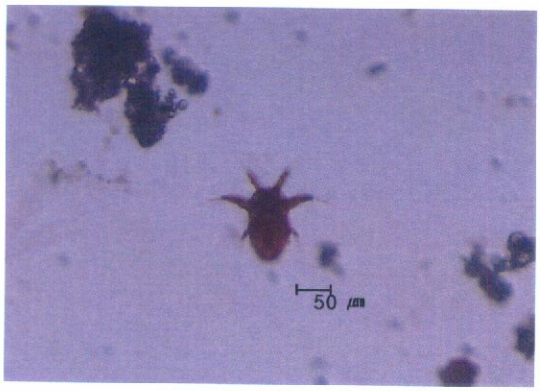
Artemia salina (Test water)



Copepod nauplius (Test water)



Polychaeta larva (Test water)

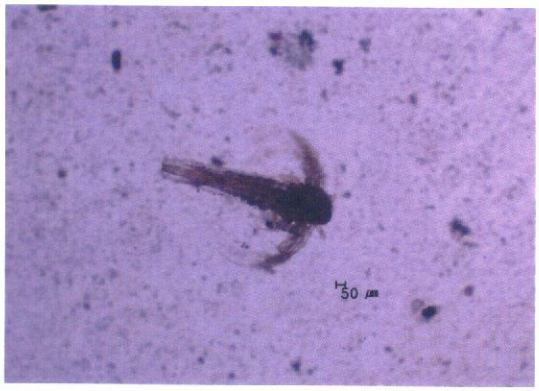


Copepod nauplius (Test water)

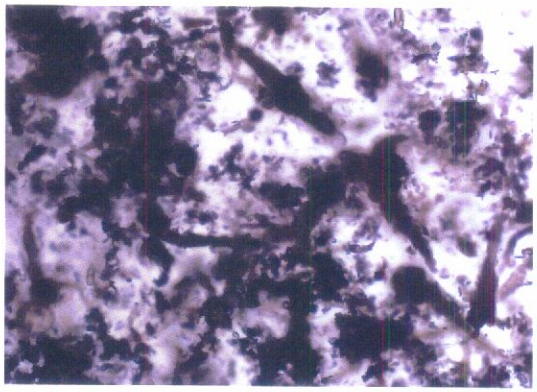
Artemia salina (Test water)

1. To be continued

· **Ballasting (11th test cycle: 2011. 12. 07)**

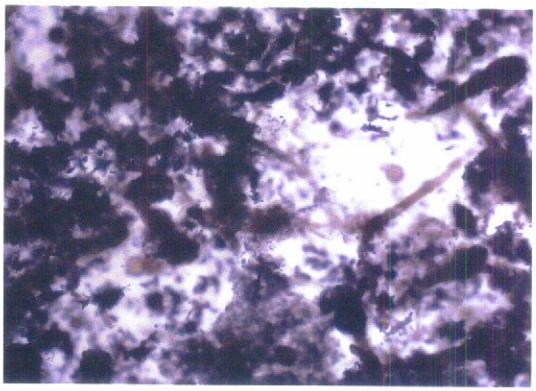


Artemia salina (Control water)



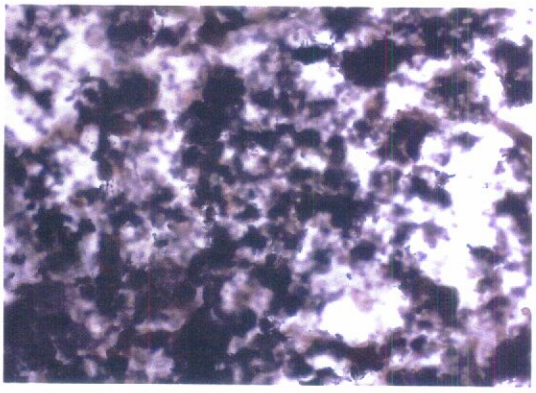
Debris (Treated water)

Copepod nauplius (Control water)



Debris (Treated water)

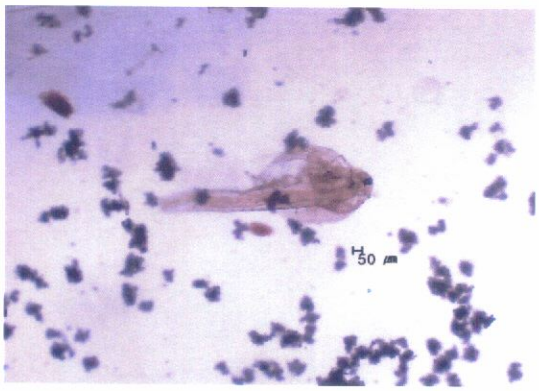
Harpacticoida (Control water)



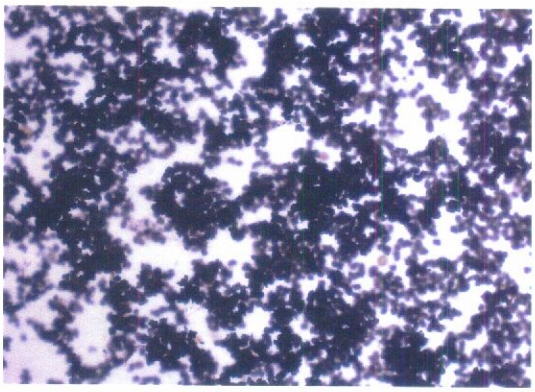
Debris (Treated water)

1. To be continued

· de-Ballasting (11th test cycle: 2011. 12. 12)

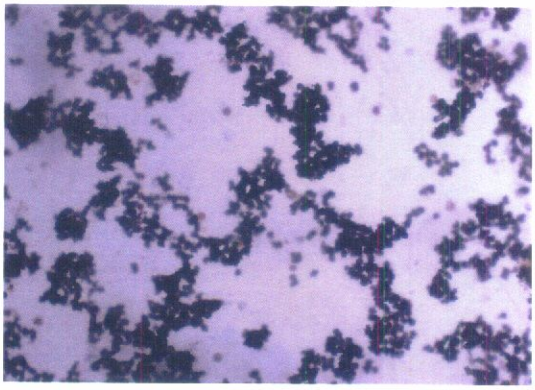


Artemia salina (Control water)



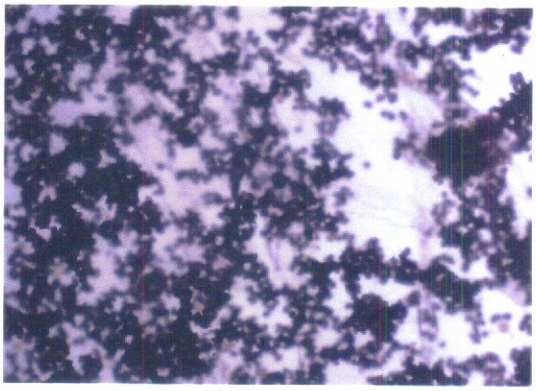
Debris (Treated water)

Artemia salina (Control water)



Debris (Treated water)

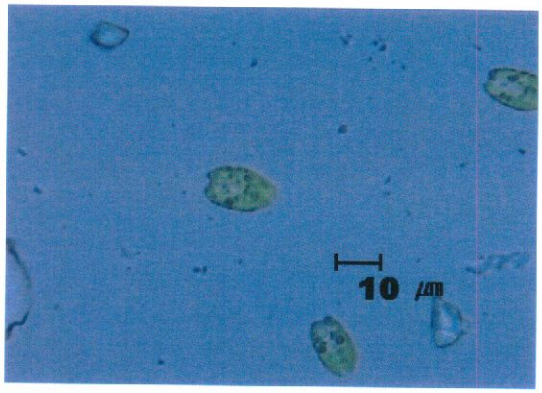
Copepod nauplius (Control water)



Debris (Treated water)

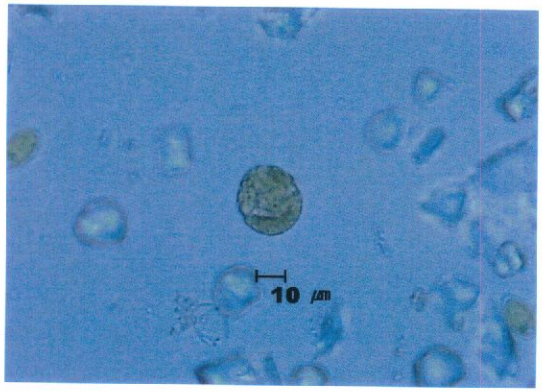
2. ≥ 10-50 μm organisms

· **Ballasting (1st test cycle: 2011. 09. 01)**

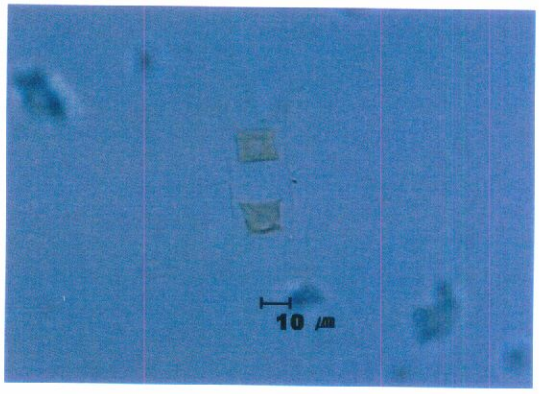


Tetraselmis suecica (Test water)

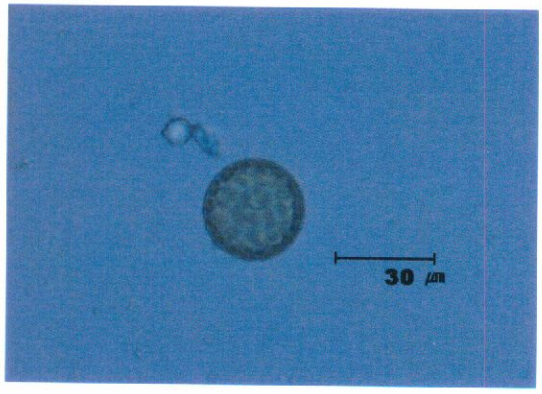
Chaetoceros sp. (Test water)



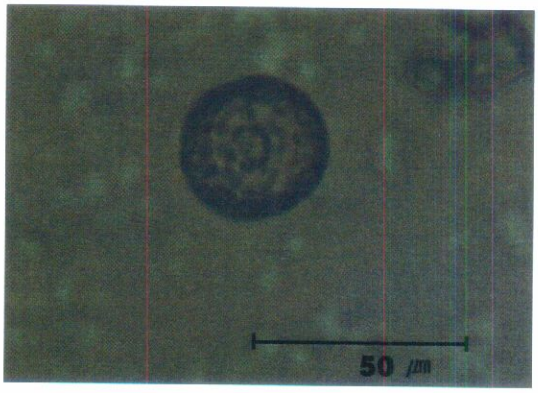
Scrippsiella sp. (Test water)



Chaetoceros sp. (Test water)



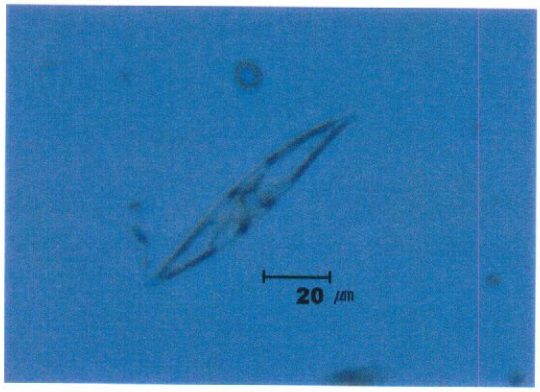
Thalassiosira sp. (Test water)



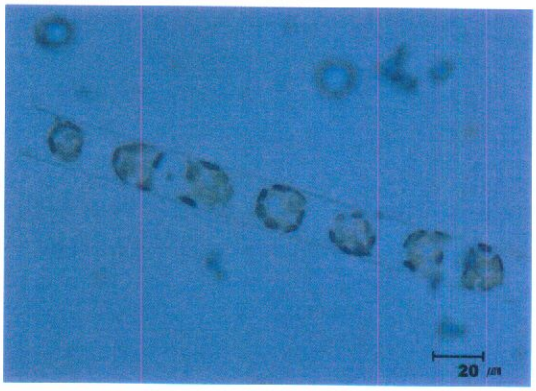
Thalassiosira sp. (Test water)

2. To be continued

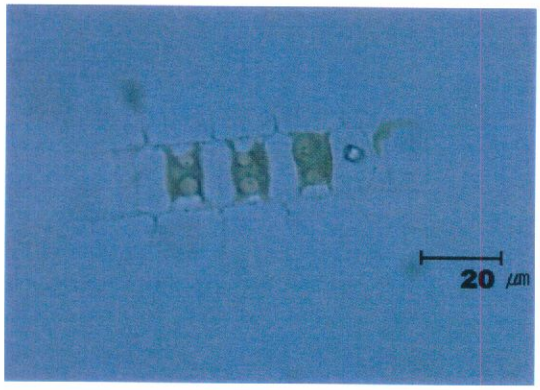
· **Ballasting (1st test cycle: 2011. 09. 01)**

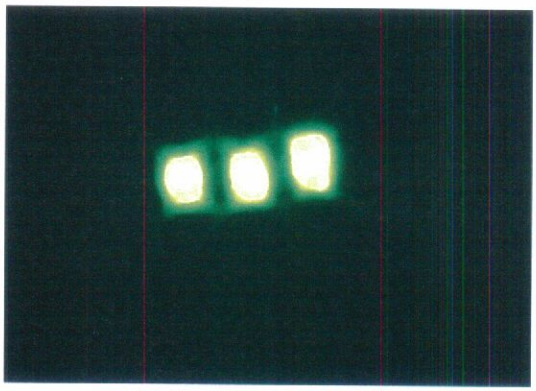


Pleurosigma sp. (Control water)



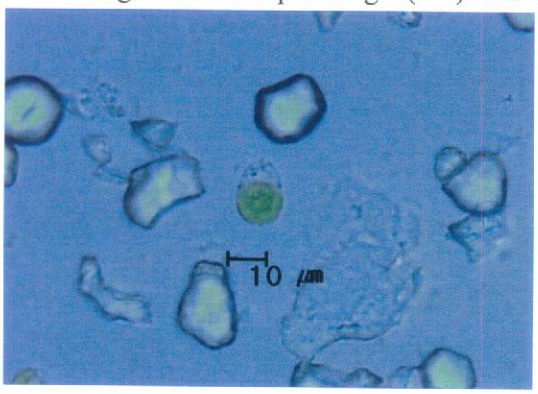
Chaetoceros sp. (Control water)

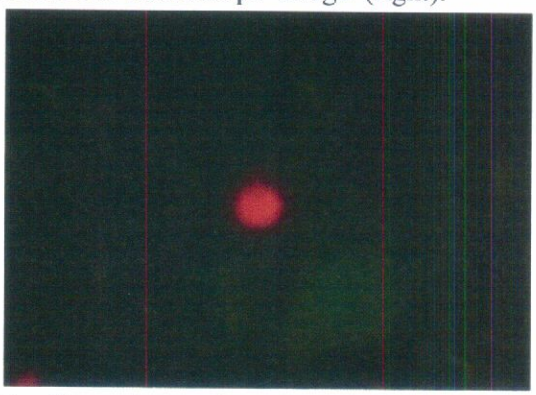




Chaetoceros sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).



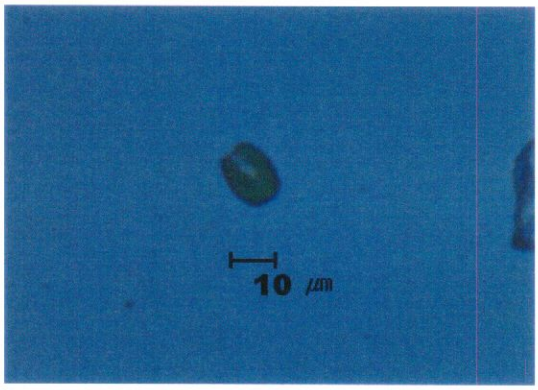


Tetraselmis suecica (Viable, Treated water)

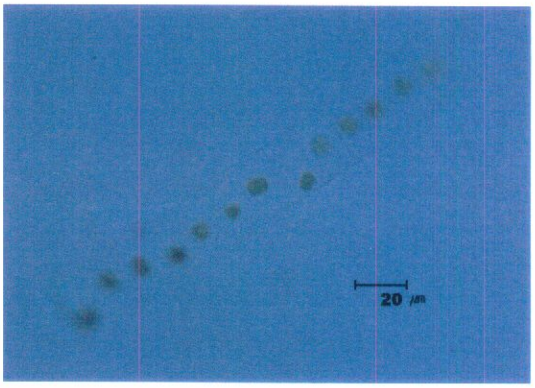
Light microscope image (left) and auto-fluorescence microscope image (right).

2. To be continued

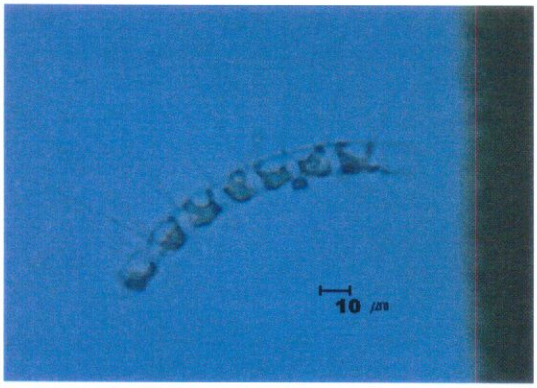
· **de-Ballasting (1st test cycle: 2011. 09. 06)**

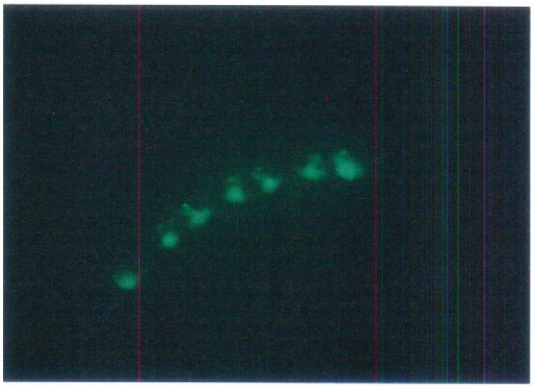


Tetraselmis suecica (Control water)



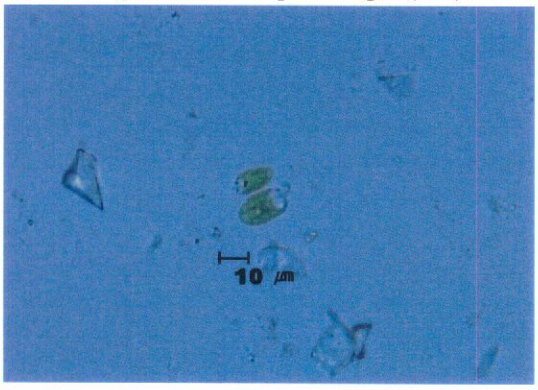
Chaetoceros sp. (Control water)

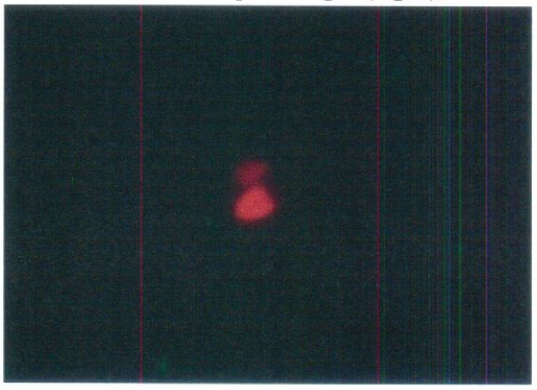




Chaetoceros sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).



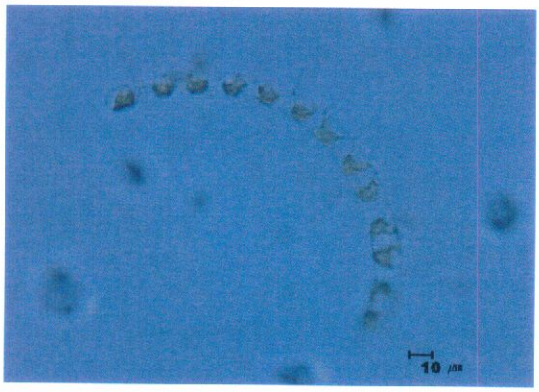


Tetraselmis suecica (Viable, Treated water)

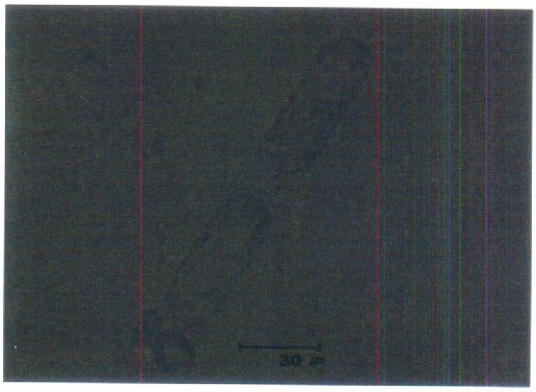
Light microscope image (left) and auto-fluorescence microscope image (right).

2. To be continued

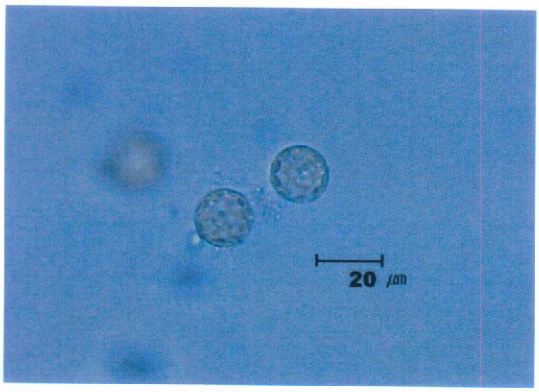
· **Ballasting (2nd test cycle: 2011. 09. 28)**



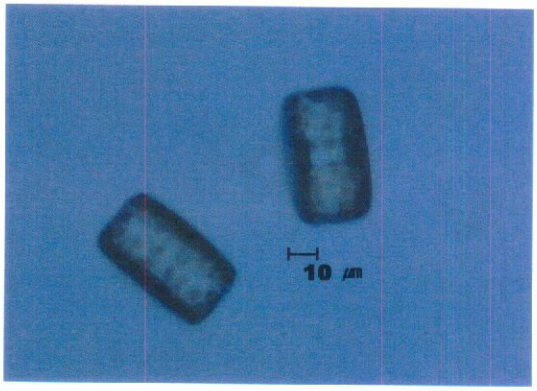
Chaetoceros sp. (Test water)



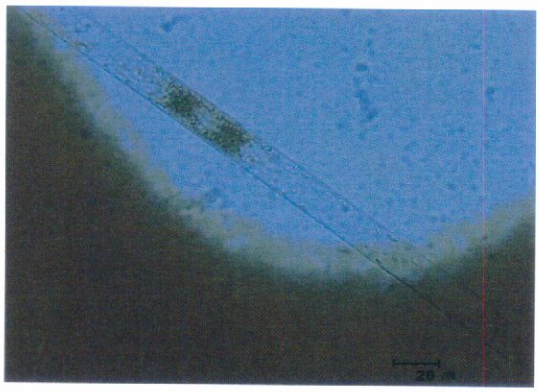
Stephanopyxis sp. (Test water)



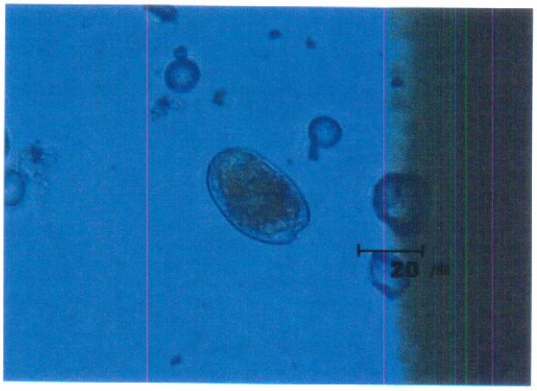
Thalassiosira sp. (Test water)



Thalassiosira sp. (Test water)



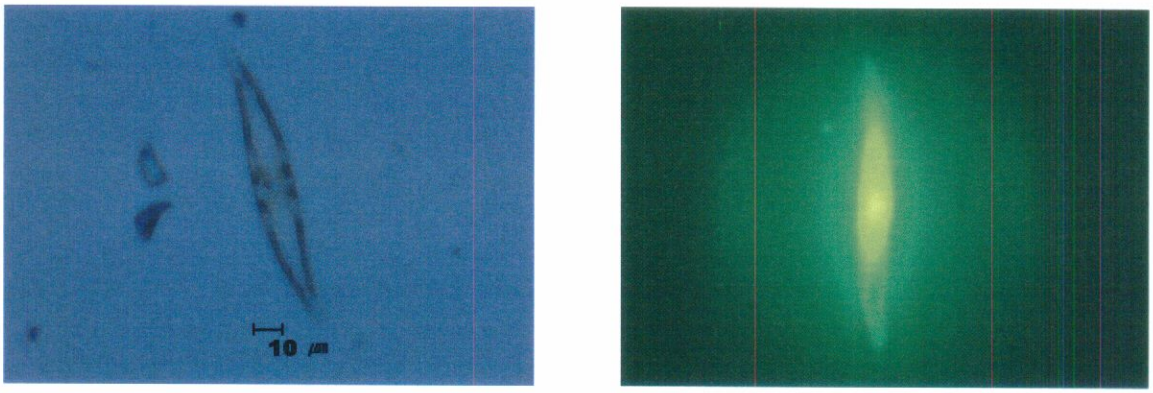
Rhizosolenia sp. (Test water)



Prorocentrum sp. (Test water)

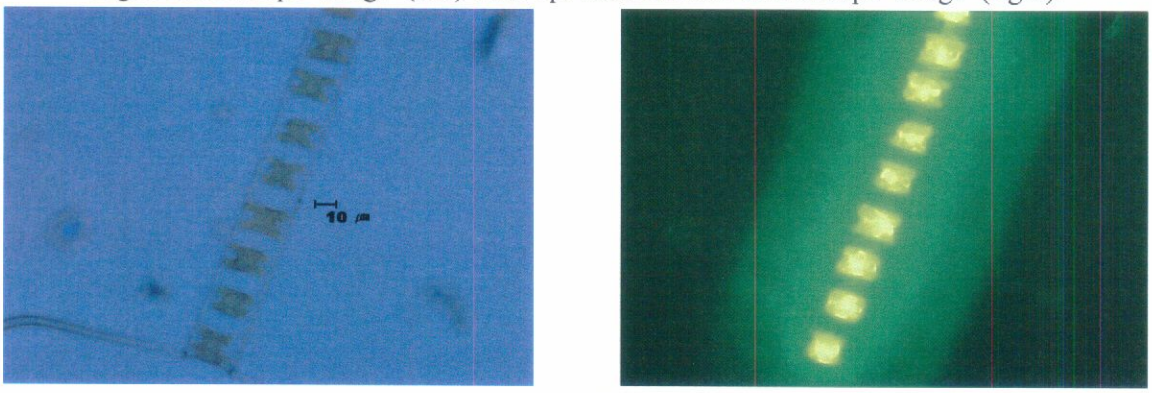
2. To be continued

· **Ballasting (2nd test cycle: 2011. 09. 28)**



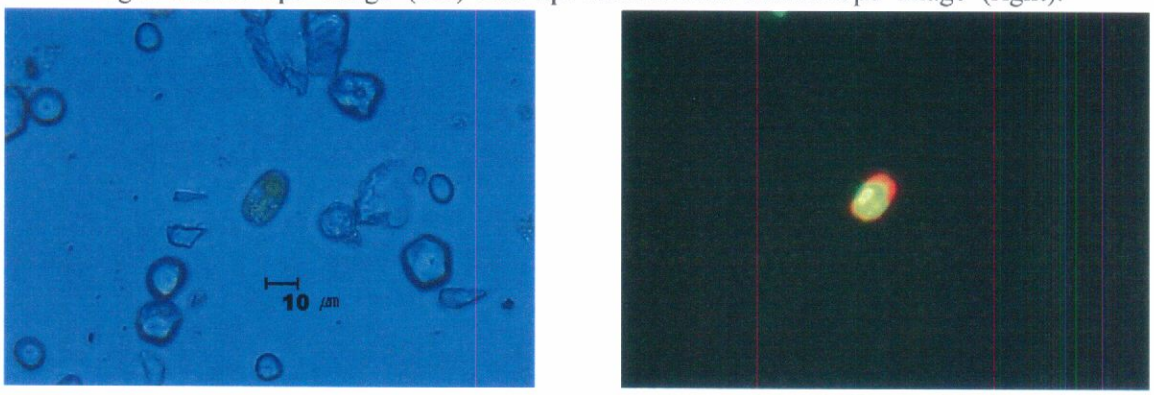
Pleurosigma sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).



Chaetoceros sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).

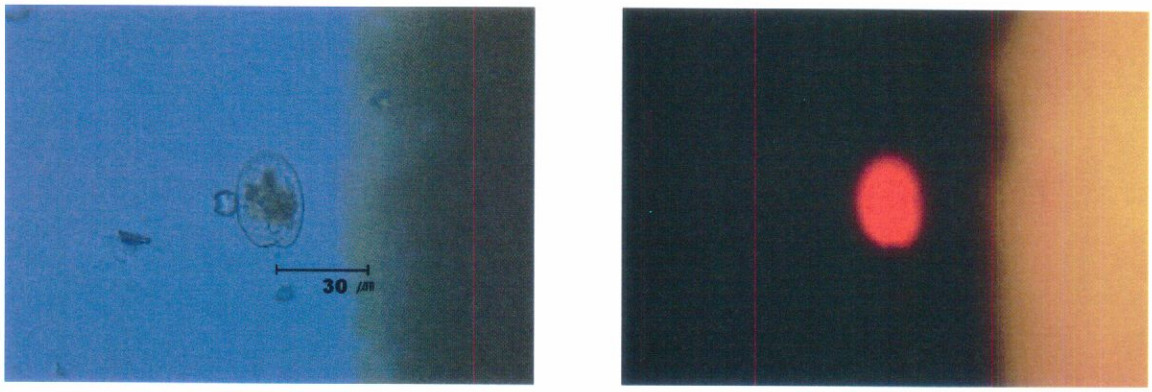


Tetraselmis suecica (Viable, Treated water)

Light microscope image (left) and epi-fluorescence microscope image (right).

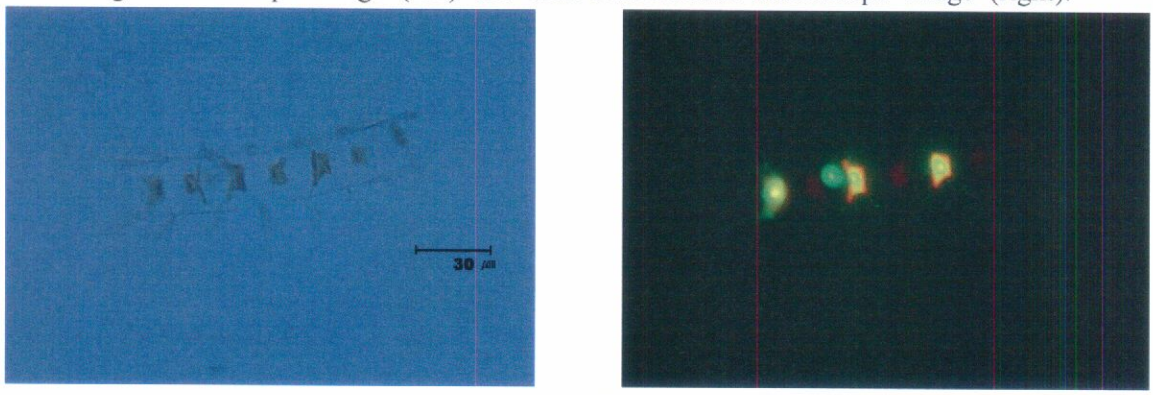
2. To be continued

· **de-Ballasting (2nd test cycle: 2011. 10. 03)**



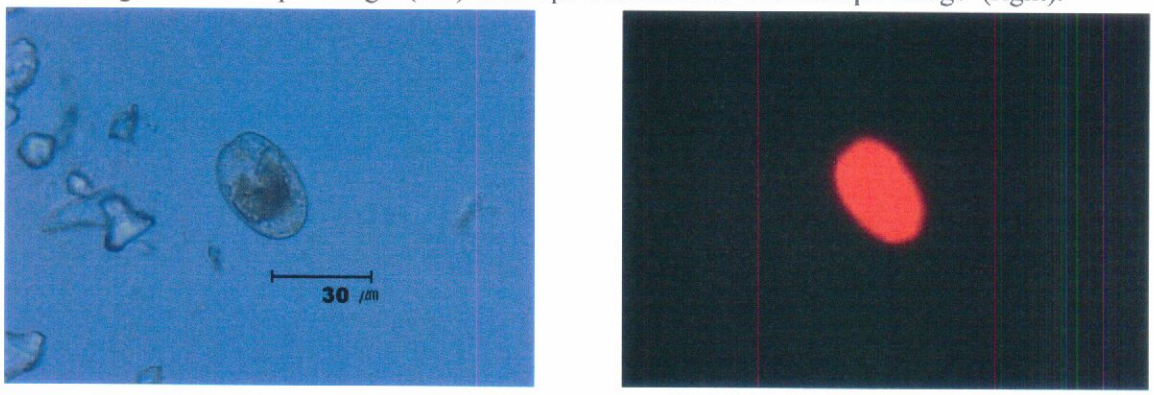
Prorocentrum sp. (Control water)

Light microscope image (left) and auto-fluorescence microscope image (right).



Chaetoceros sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).

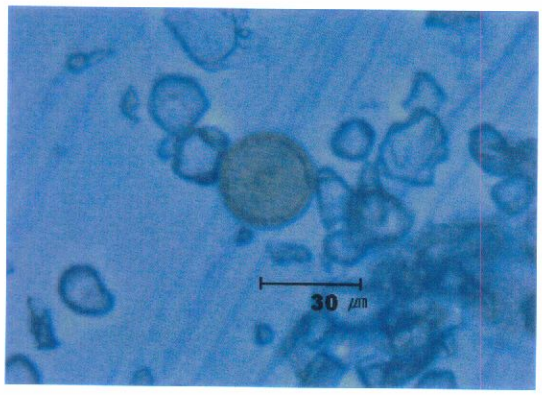


Prorocentrum sp. (Viable, Treated water)

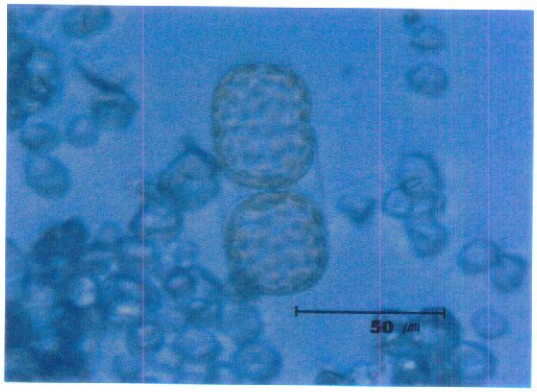
Light microscope image (left) and auto-fluorescence microscope image (right).

2. To be continued

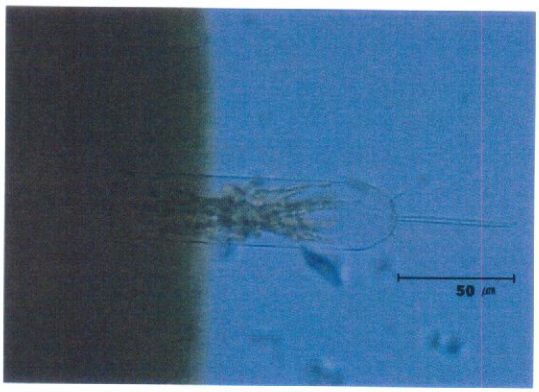
· **Ballasting (3rd test cycle: 2011. 10. 05)**



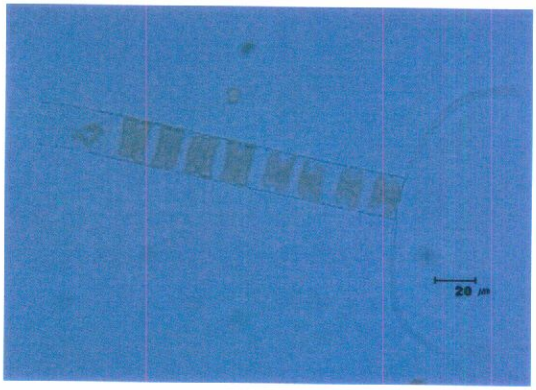
Thalassiosira sp. (Test water)



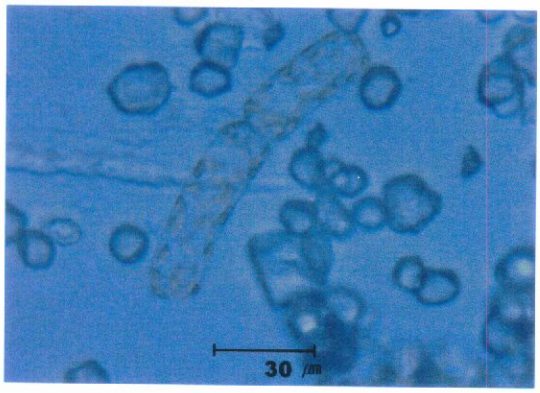
Stephanopyxis sp. (Test water)



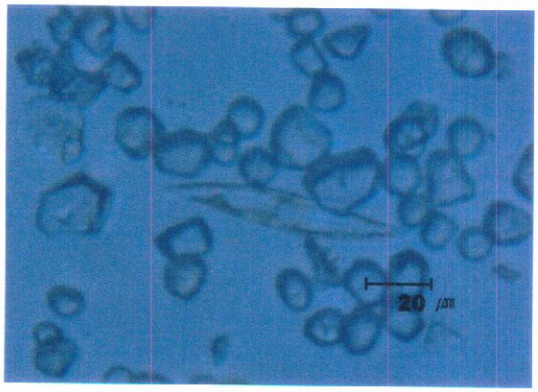
Ditylum brightwellii (Test water)



Chaetoceros sp. (Test water)



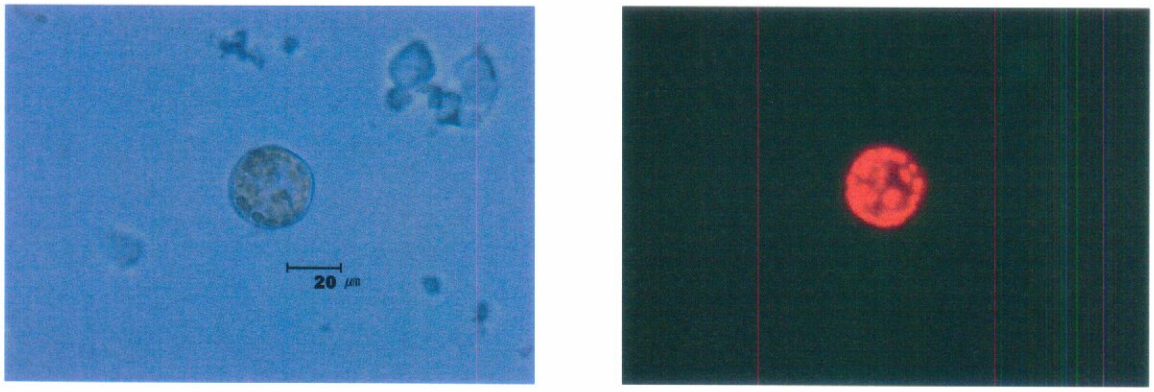
Guinardia sp. (Test water)



Pleurosigma sp. (Test water)

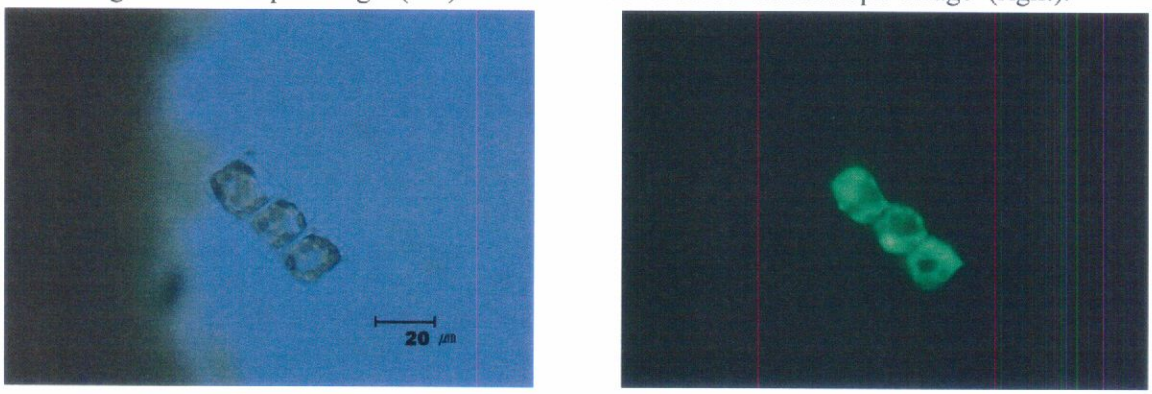
2. To be continued

· **Ballasting (3rd test cycle: 2011. 10. 05)**



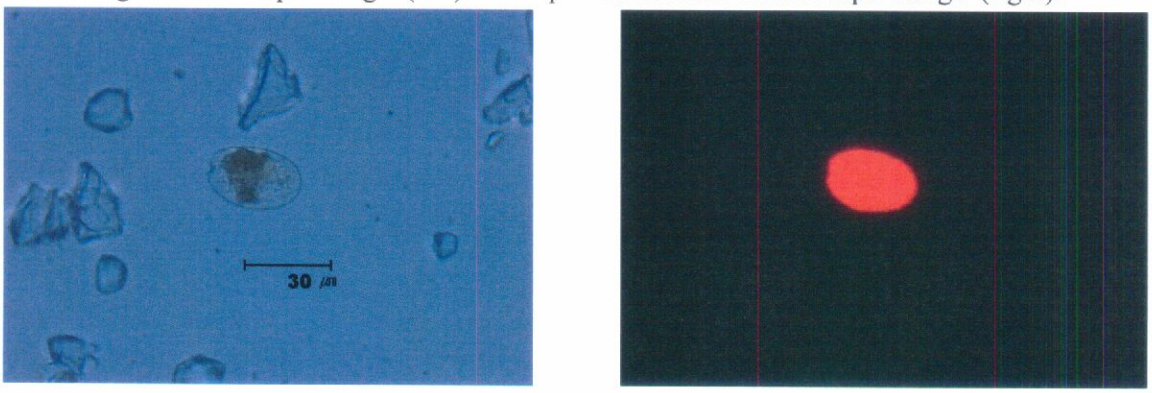
Thalassiosira sp. (Control water)

Light microscope image (left) and auto-fluorescence microscope image (right).



Chaetoceros sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).

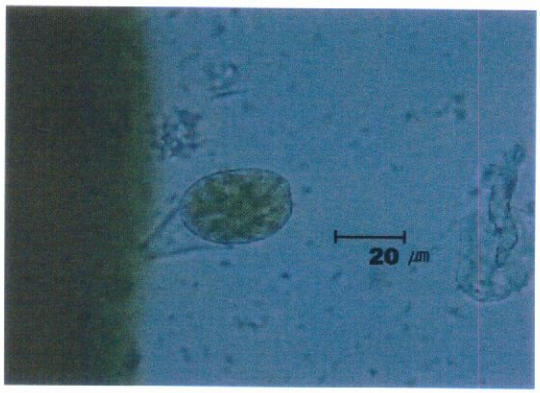


Prorocentrum sp. (Viable, Treated water)

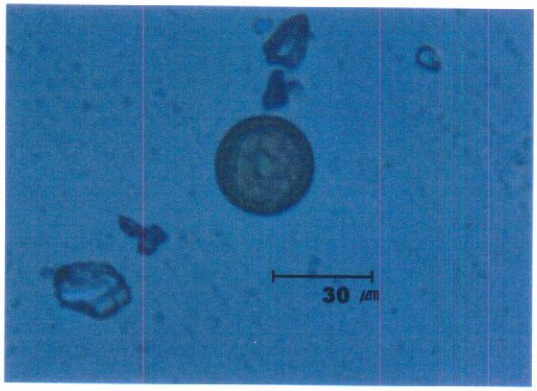
Light microscope image (left) and auto-fluorescence microscope image (right).

2. To be continued

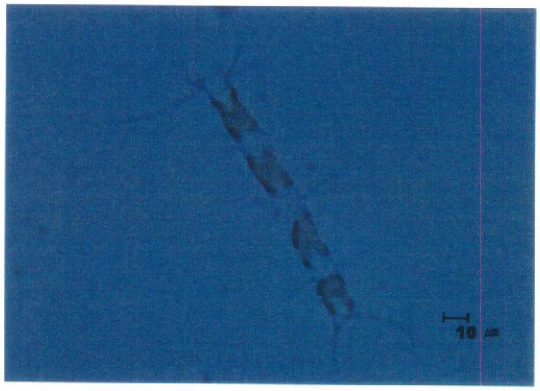
· de-Ballasting (3rd test cycle: 2011. 10. 10)

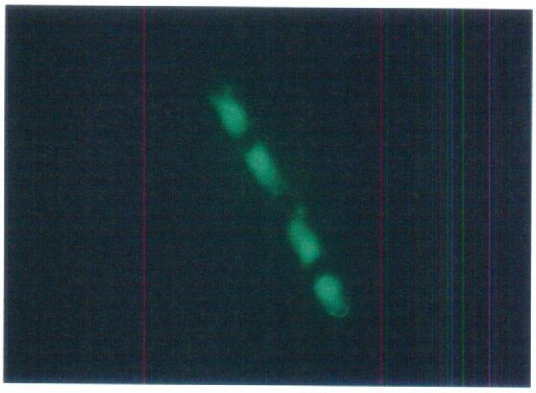


Prorocentrum sp. (Control water)



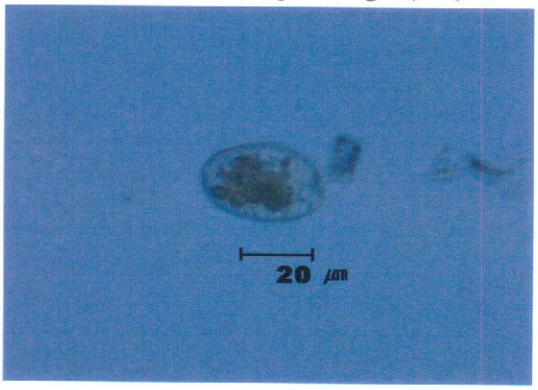
Thalassiosira sp. (Control water)

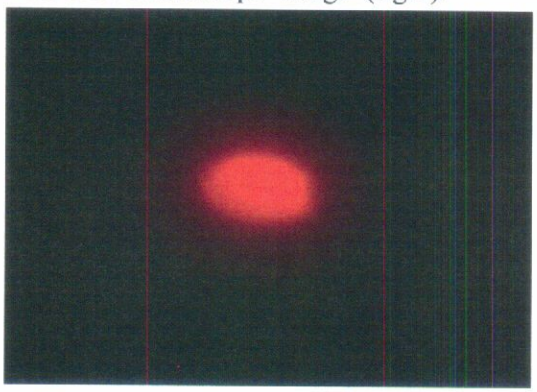




Chaetoceros sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).



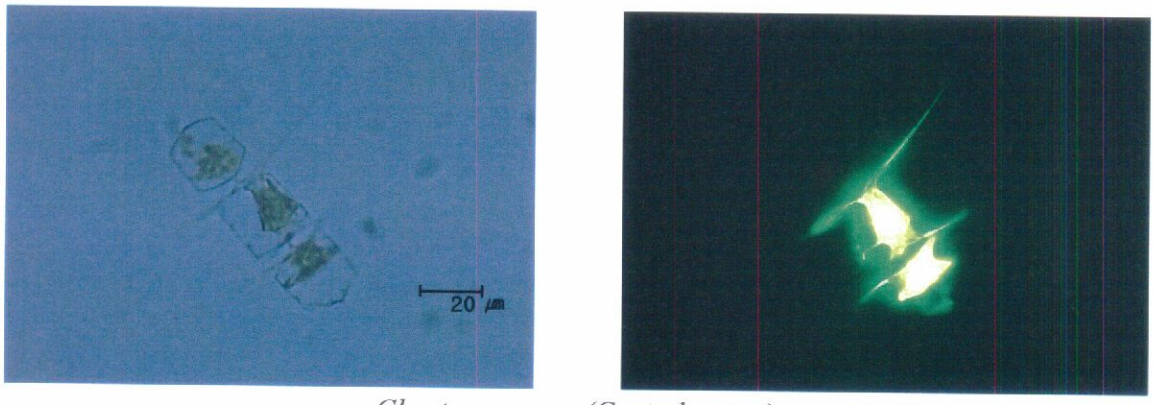


Prorocentrum sp. (Viable, Treated water)

Light microscope image (left) and auto-fluorescence microscope image (right).

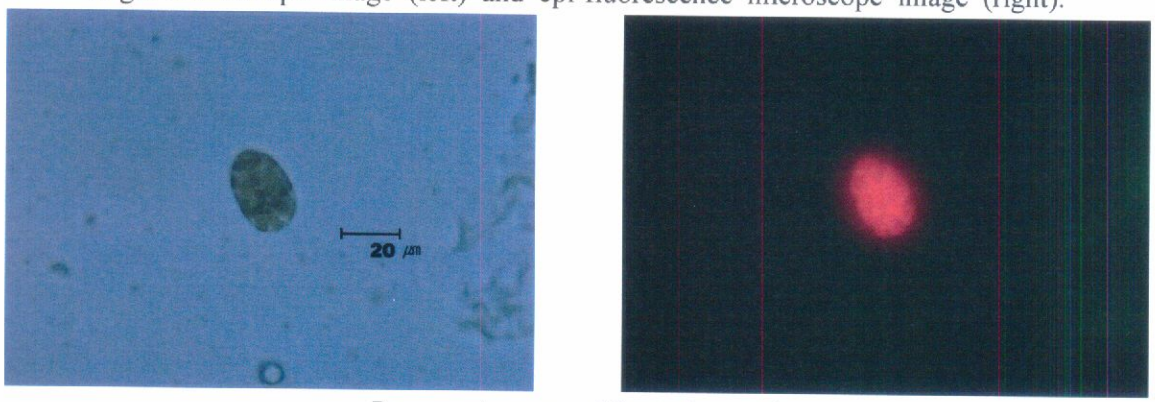
2. To be continued

· **Ballasting (4th test cycle: 2011. 10. 12)**



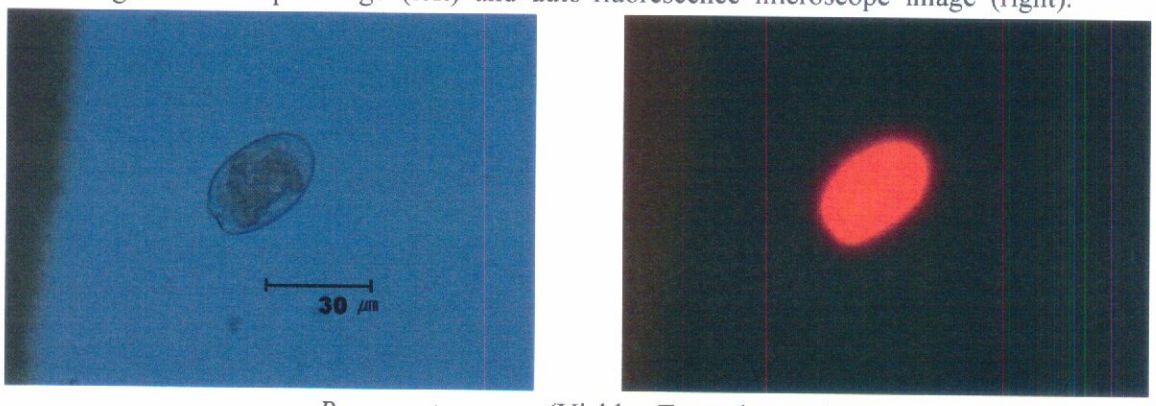
Chaetoceros sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).



Prorocentrum sp. (Control water)

Light microscope image (left) and auto-fluorescence microscope image (right).

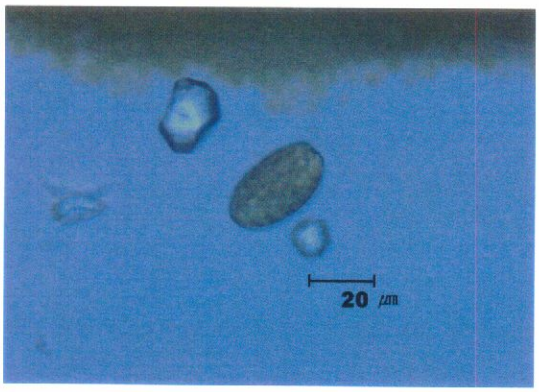


Prorocentrum sp. (Viable, Treated water)

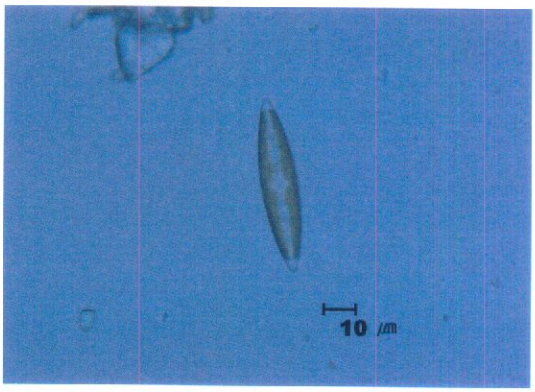
Light microscope image (left) and auto-fluorescence microscope image (right).

2. To be continued

· **Ballasting (4th test cycle: 2011. 10. 12)**

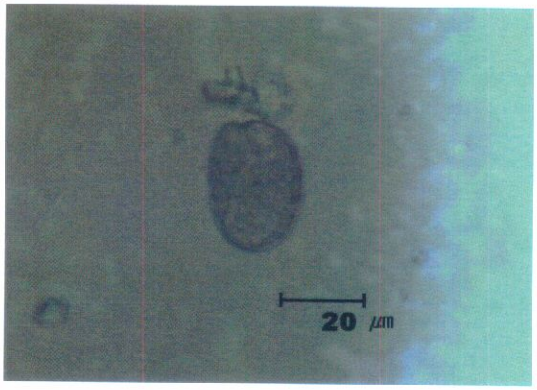


Prorocentrum sp. (Test water)

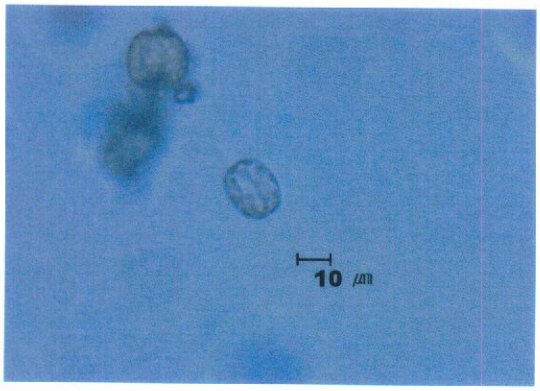


Navicula sp. (Test water)

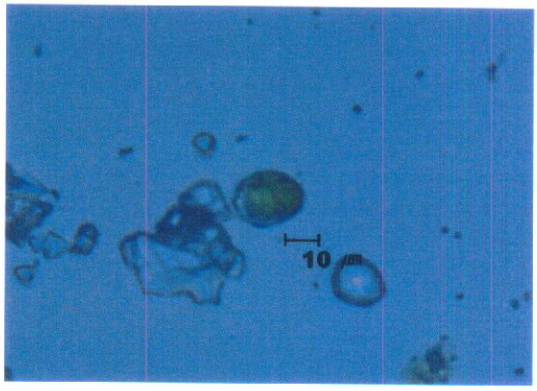
Chaetoceros sp. (Test water)



Prorocentrum sp. (Test water)



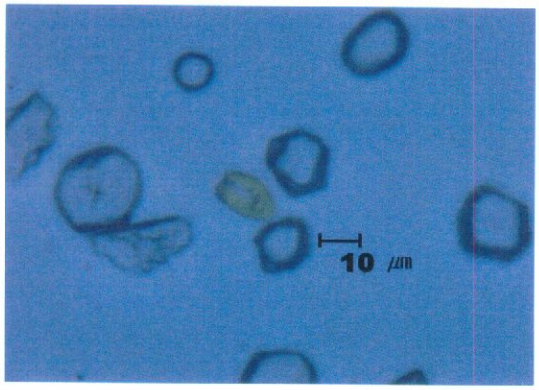
Thalassiosira sp. (Test water)

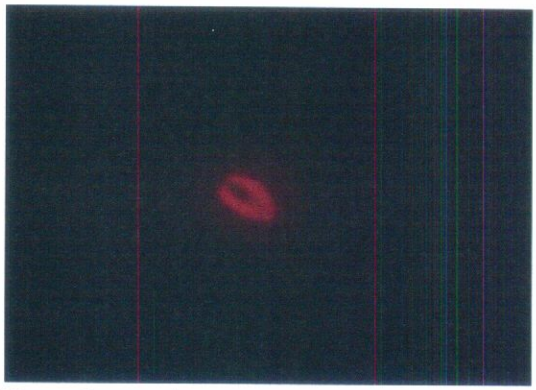


Tetraselmis suecica (Test water)

2. To be continued

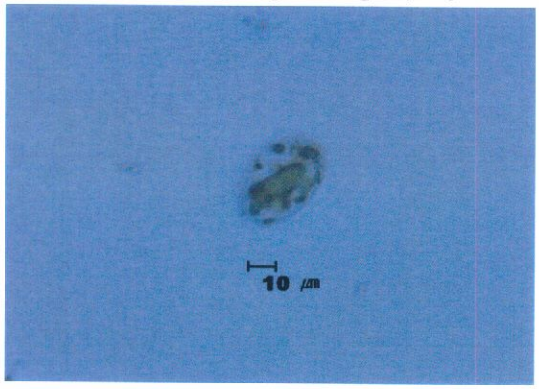
· **de-Ballasting (4th test cycle: 2011. 10. 17)**

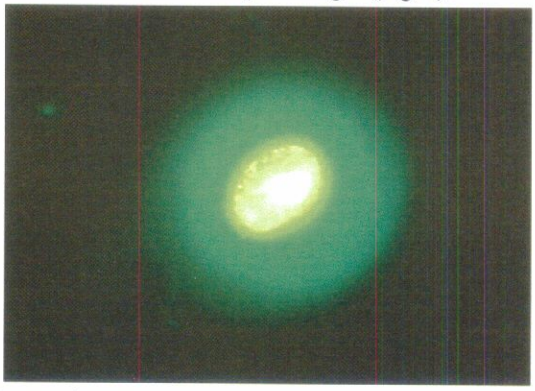




Tetraselmis suecica (Control water)

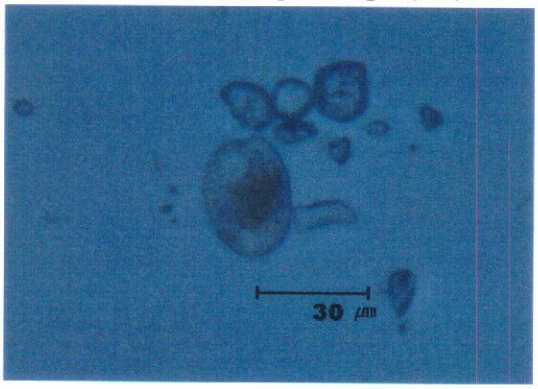
Light microscope image (left) and auto-fluorescence microscope image (right).

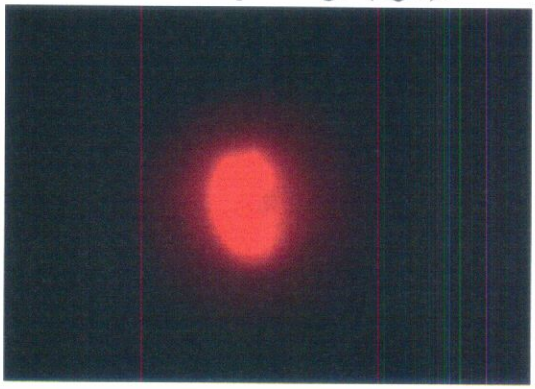




Prorocentrum sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).



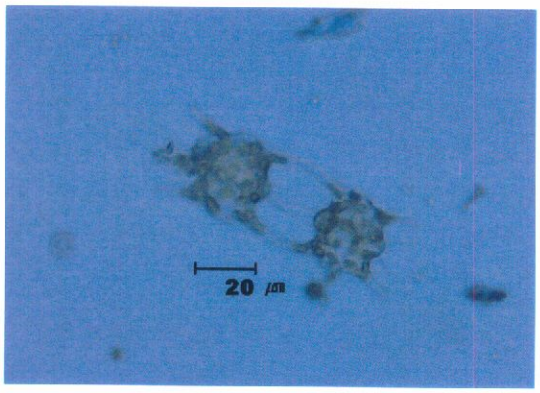


Prorocentrum sp. (Viable, Treated water)

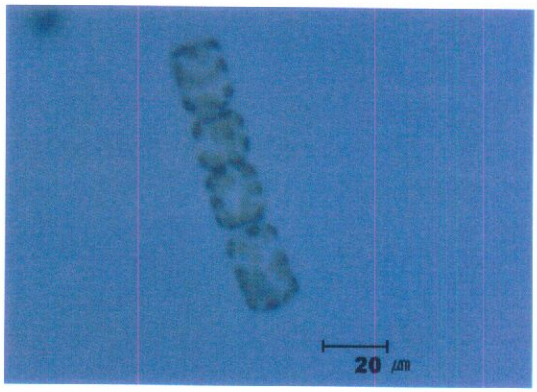
Light microscope image (left) and auto-fluorescence microscope image (right).

2. To be continued

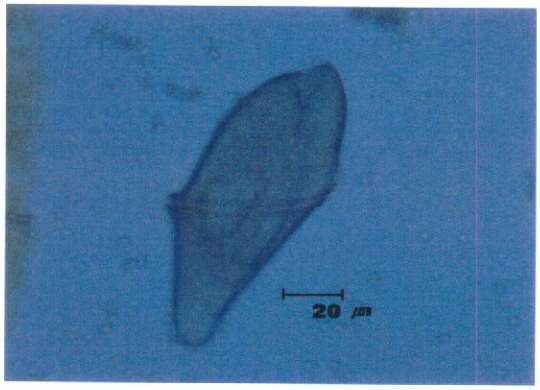
· **Ballasting (5th test cycle: 2011. 10. 19)**



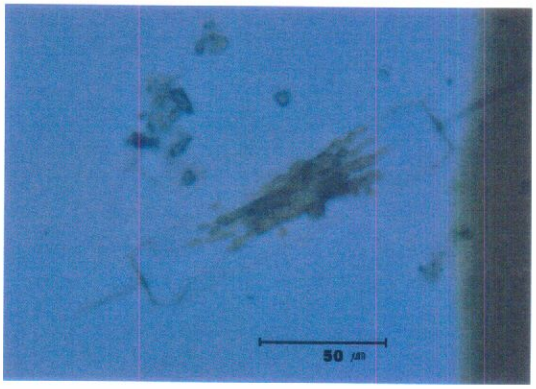
Odontella sp. (Test water)



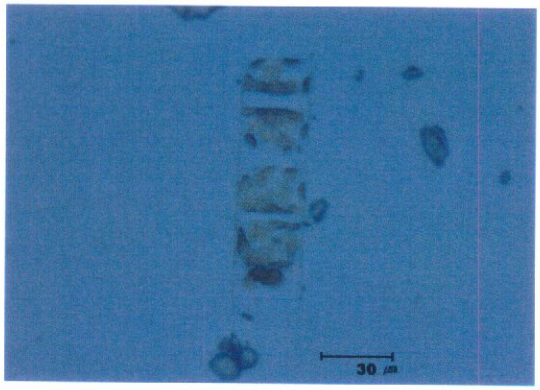
Detonula sp. (Test water)



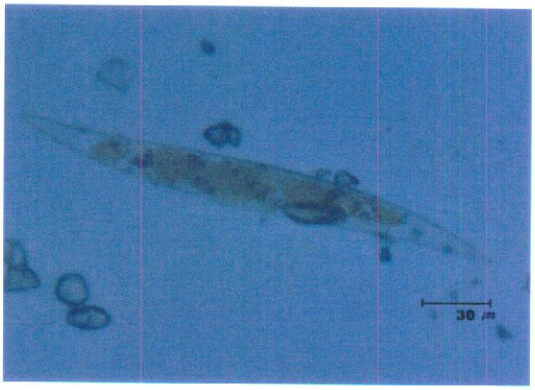
Gyrodinium sp. (Test water)



Ditylum brightwellii (Test water)



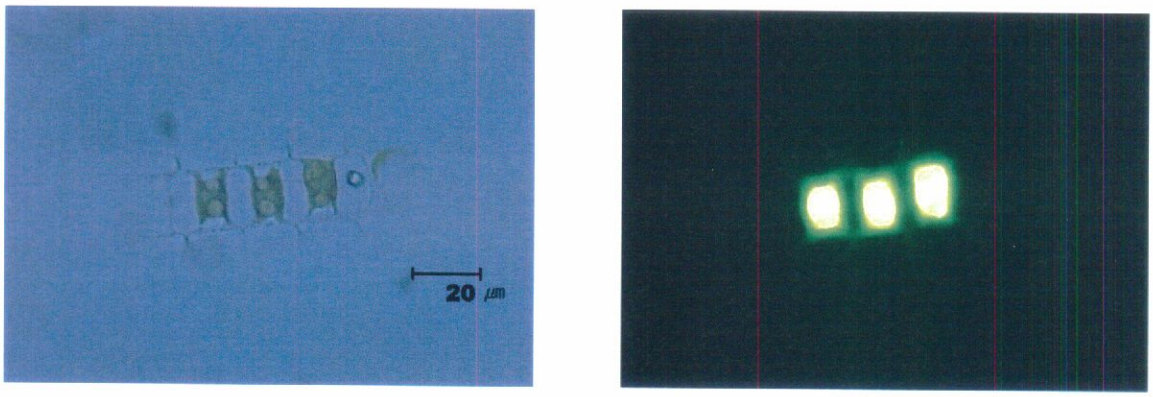
Chaetoceros sp. (Test water)



Pleurosigma sp. (Test water)

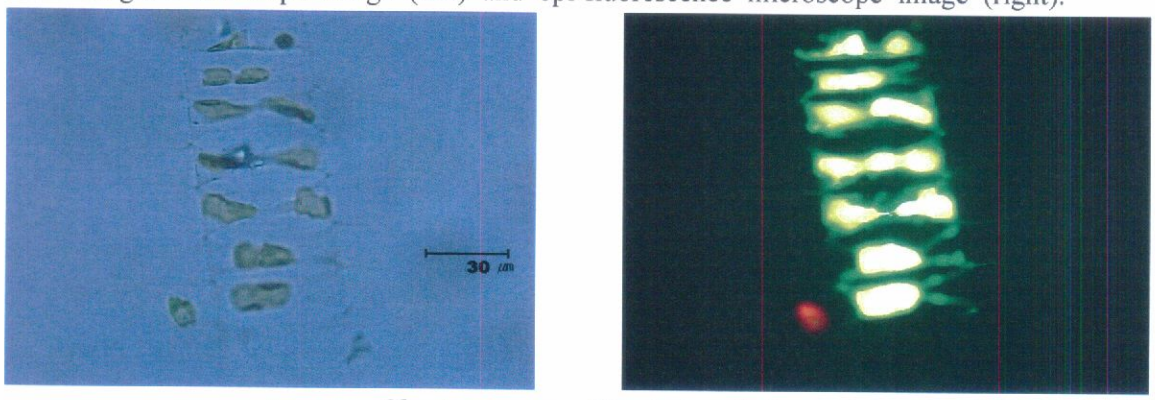
2. To be continued

· **Ballasting (5th test cycle: 2011. 10. 19)**



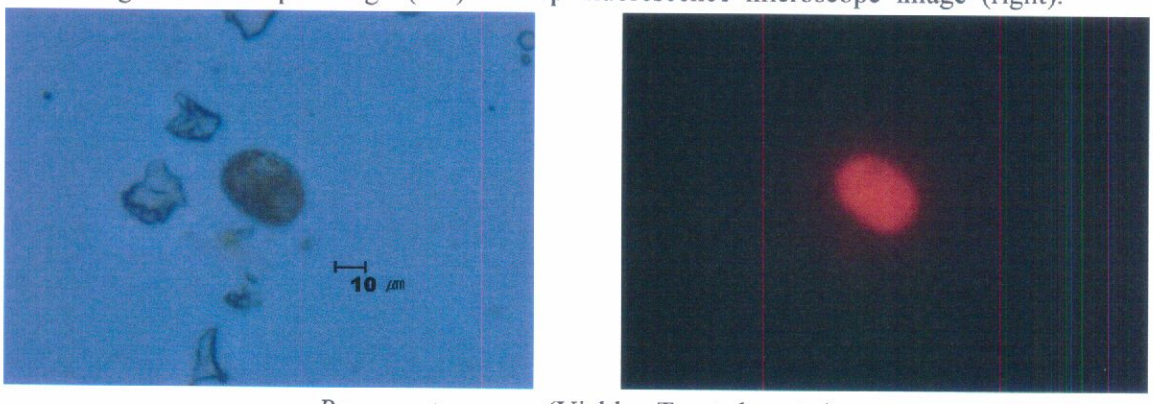
Chaetoceros sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).



Chaetoceros sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).

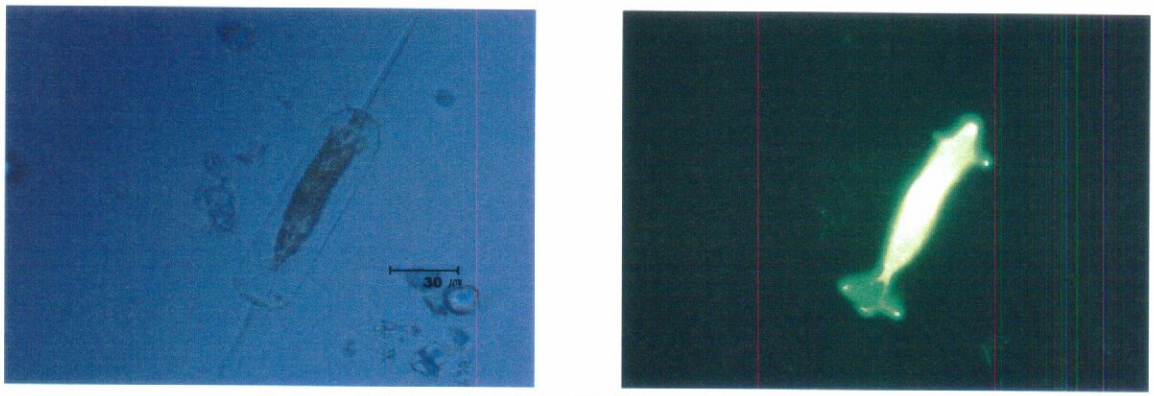


Prorocentrum sp. (Viable, Treated water)

Light microscope image (left) and auto-fluorescence microscope image (right).

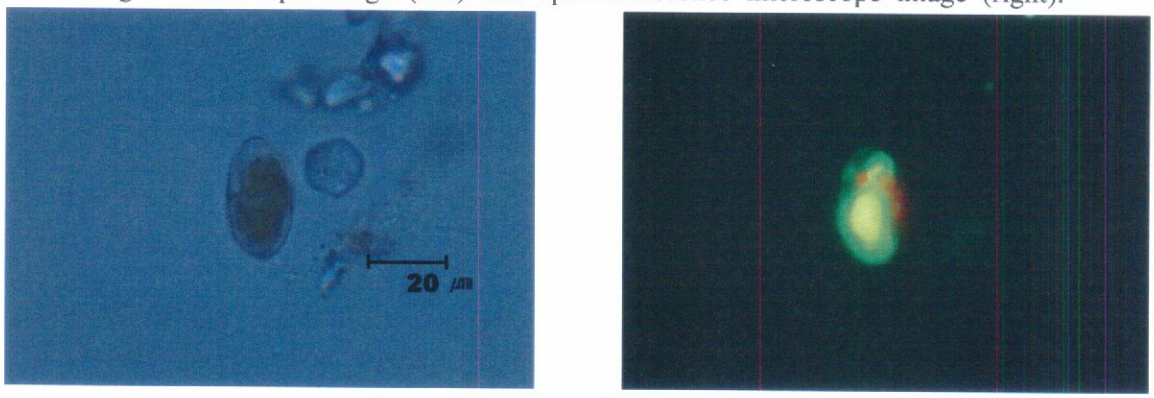
2. To be continued

· **de-Ballasting (5th test cycle: 2011. 10. 24)**



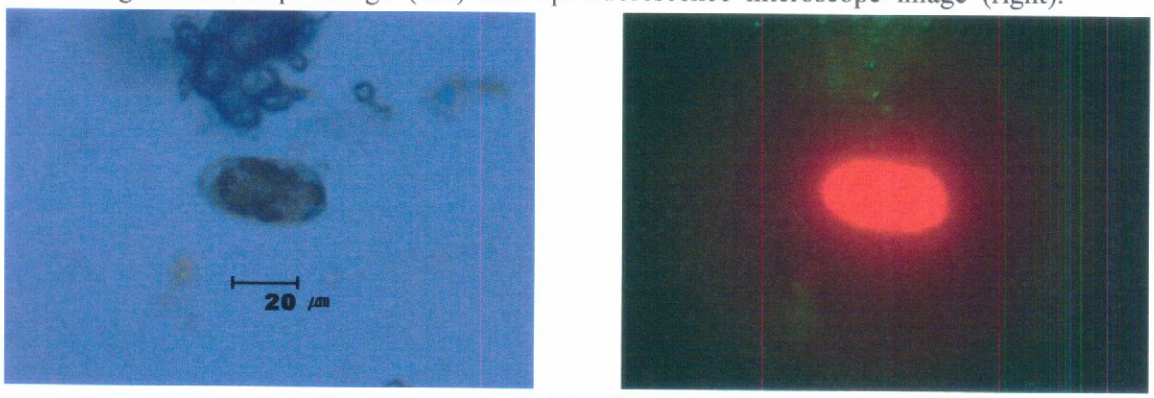
Ditylum brightwellii (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).



Prorocentrum sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).

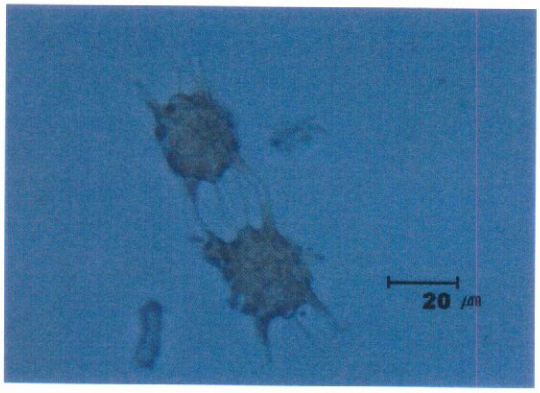


Prorocentrum sp. (Viable, Treated water)

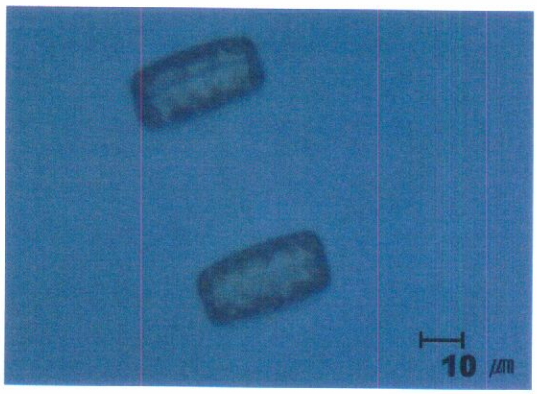
Light microscope image (left) and auto-fluorescence microscope image (right).

2. To be continued

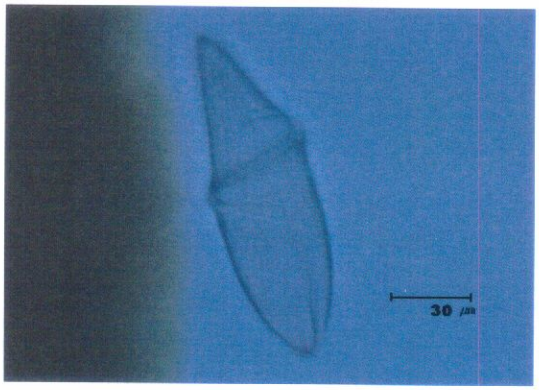
· **Ballasting (6th test cycle: 2011. 10. 26)**



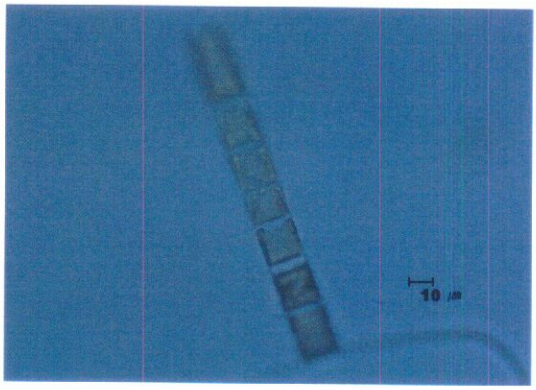
Odontella sp. (Test water)



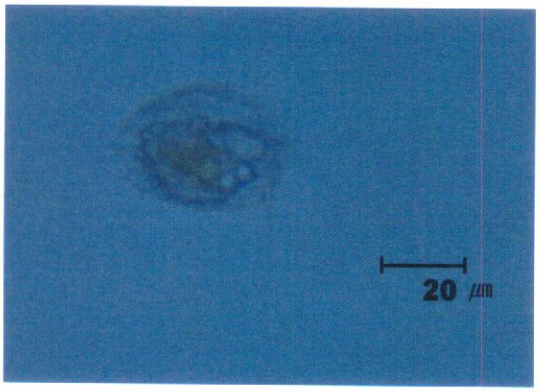
Thalassiosira sp. (Test water)



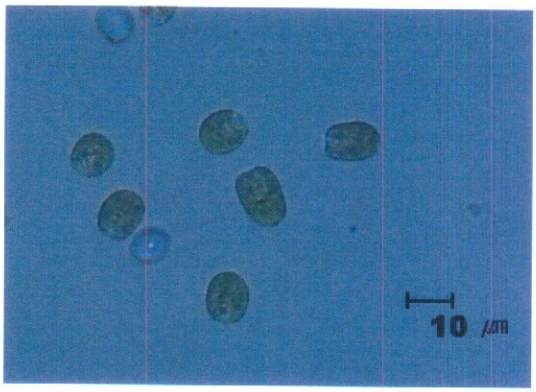
Gyrodinium sp. (Test water)



Chaetoceros sp. (Test water)



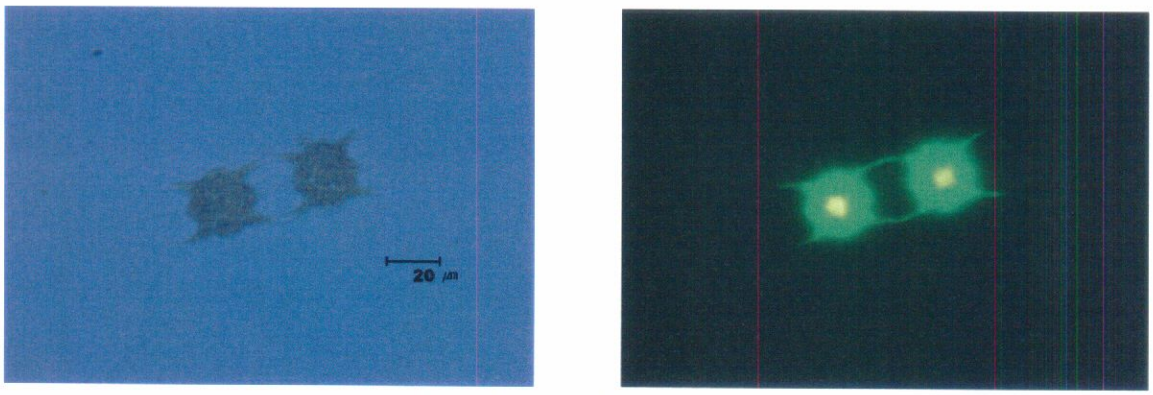
Protozoa (Test water)



Tetraselmis suecica (Test water)

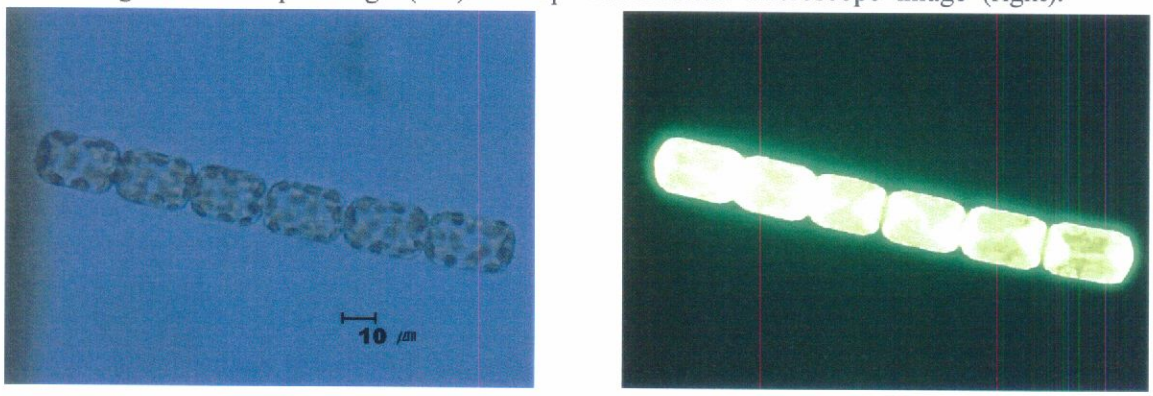
2. To be continued

· **Ballasting (6th test cycle: 2011. 10. 26)**



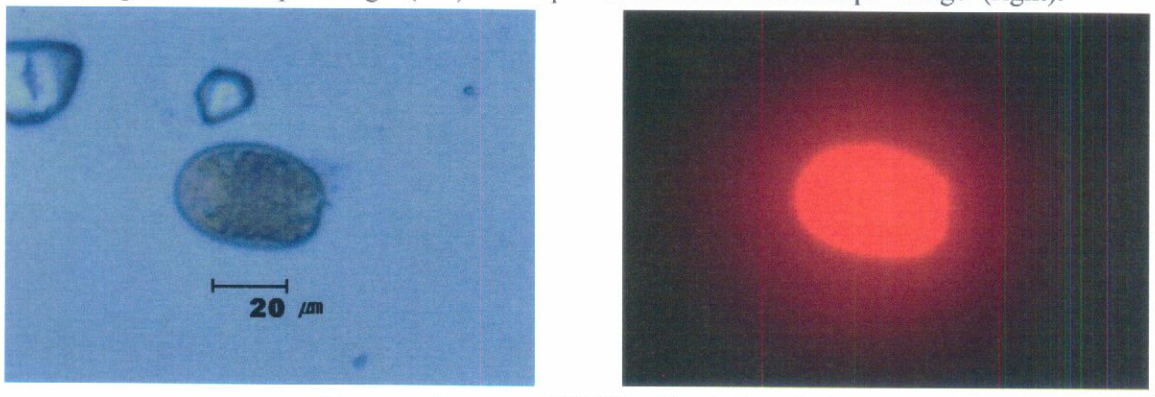
Odontella sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).



Detonula sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).

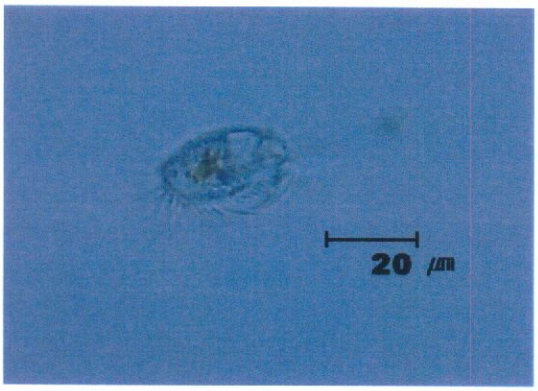


Prorocentrum sp. (Viable, Treated water)

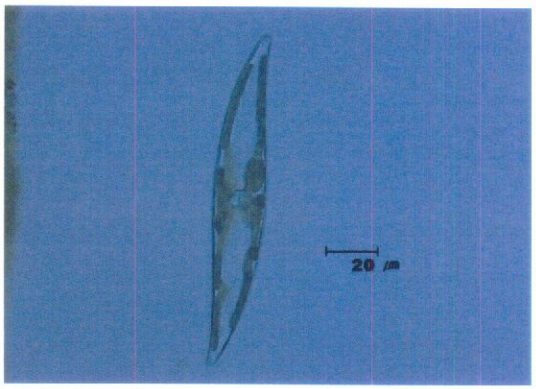
Light microscope image (left) and auto-fluorescence microscope image (right).

2. To be continued

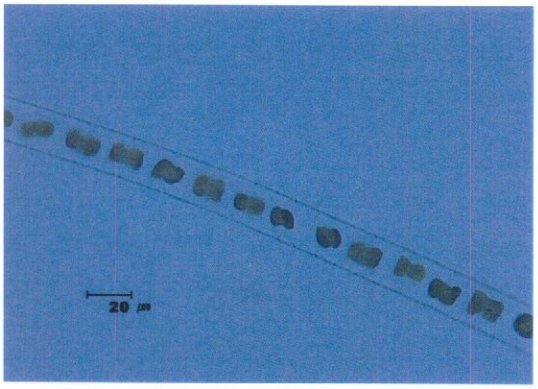
· **de-Ballasting (6th test cycle: 2011. 10. 31)**

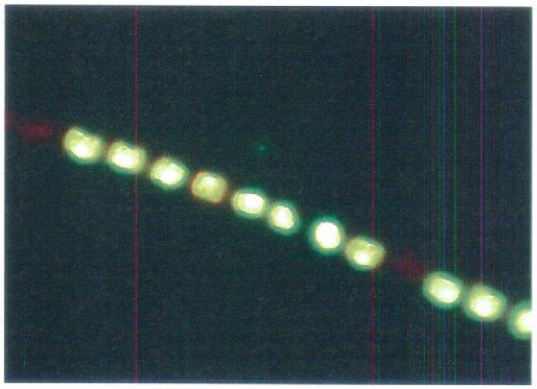


Protozoa (Control water)



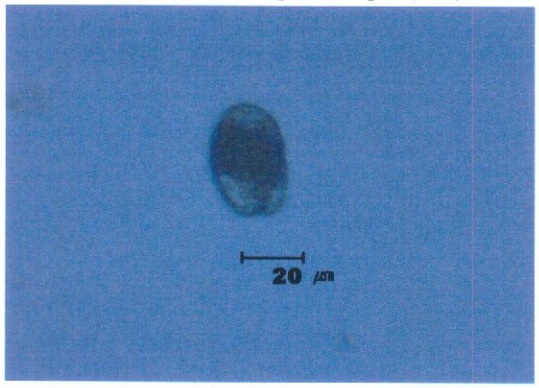
Pleurosigma sp. (Control water)

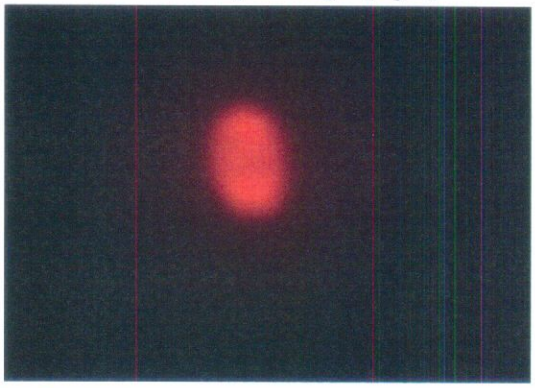




Chaetoceros sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).



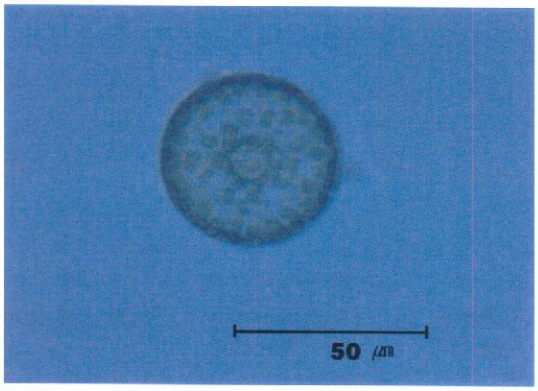


Prorocentrum sp. (Viable, Treated water)

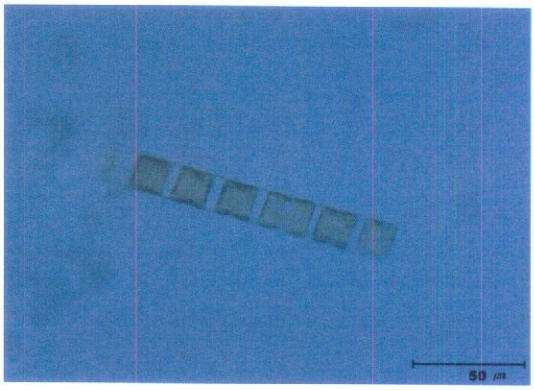
Light microscope image (left) and auto-fluorescence microscope image (right).

2. To be continued

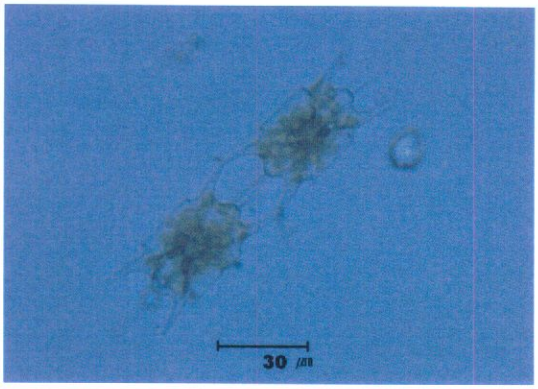
· **Ballasting (7th test cycle: 2011. 11. 02)**



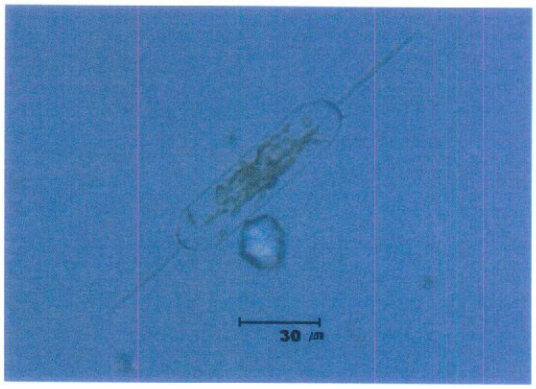
Coscinodiscus sp. (Test water)



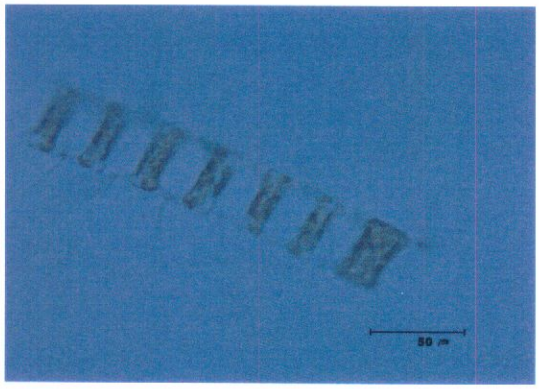
Chaetoceros sp. (Test water)



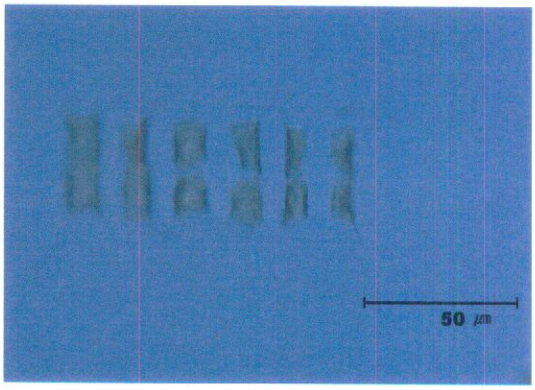
Odontella sp. (Test water)



Ditylum brightwellii (Test water)



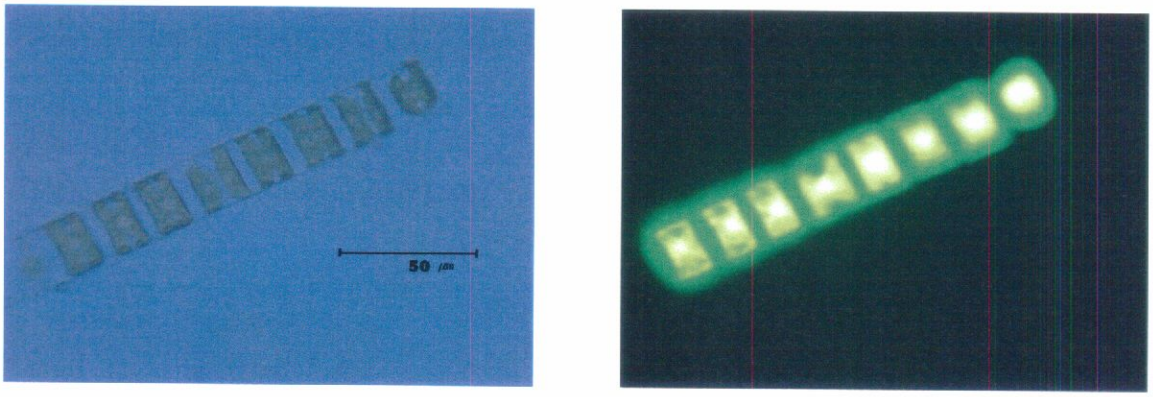
Chaetoceros sp. (Test water)



Chaetoceros sp. (Test water)

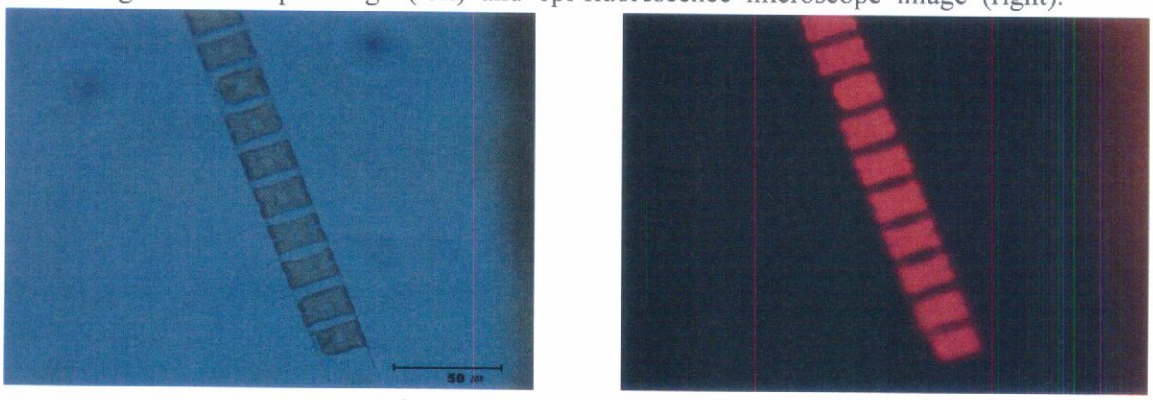
2. To be continued

· **Ballasting (7th test cycle: 2011. 11. 02)**



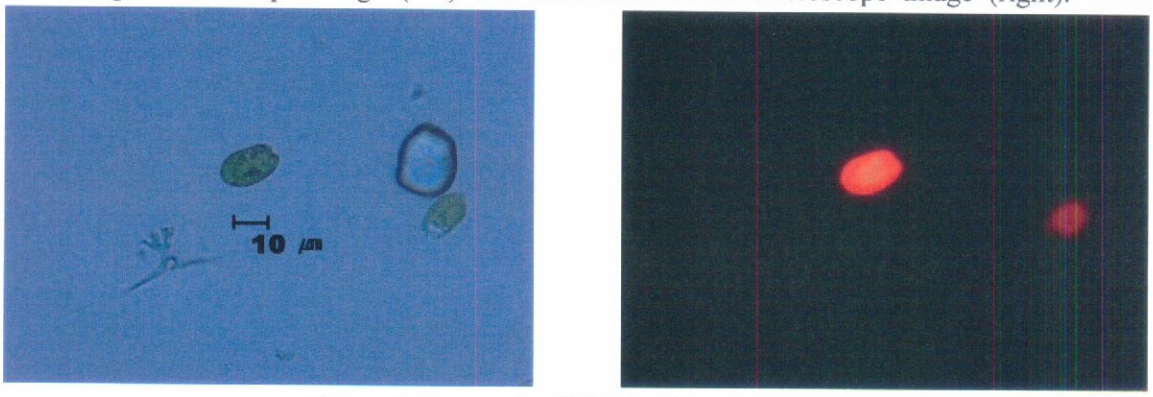
Chaetoceros sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).



Chaetoceros sp. (Control water)

Light microscope image (left) and auto-fluorescence microscope image (right).

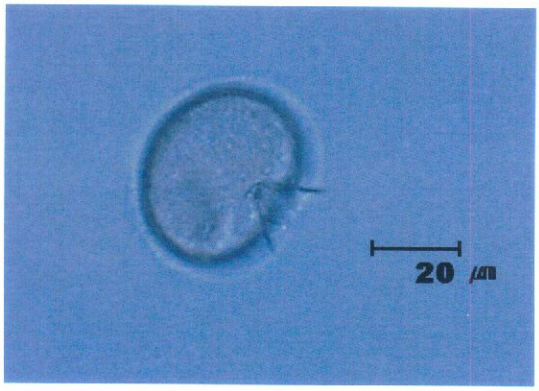


Tetraselmis suecica (Viable, Treated water)

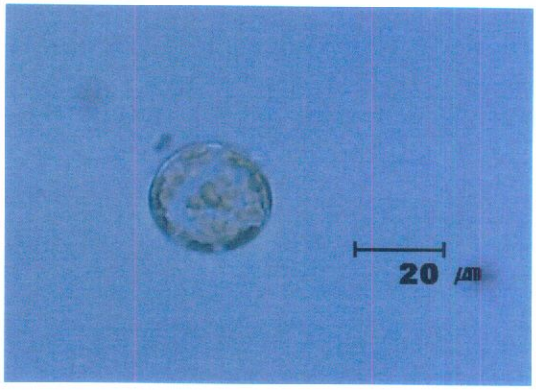
Light microscope image (left) and auto-fluorescence microscope image (right).

2. To be continued

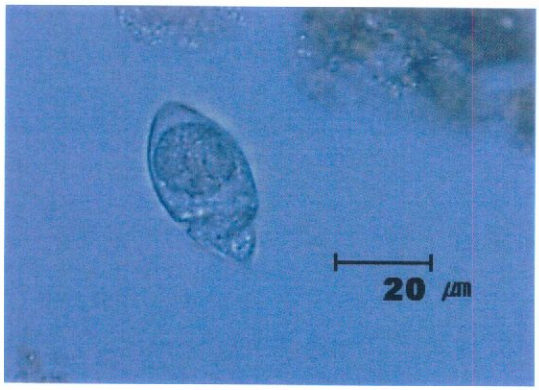
· **de-Ballasting (7th test cycle: 2011. 11. 07)**



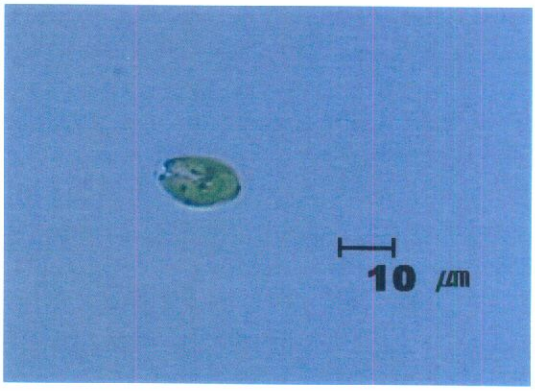
Protoperidinium sp. (Control water)



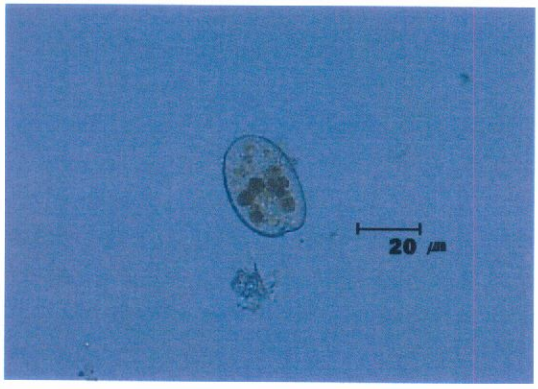
Thalassiosira sp. (Control water)

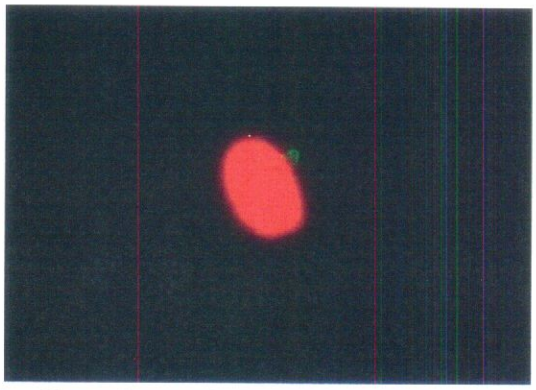


Katodinium sp. (Control water)



Tetraselmis suecica (Control water)



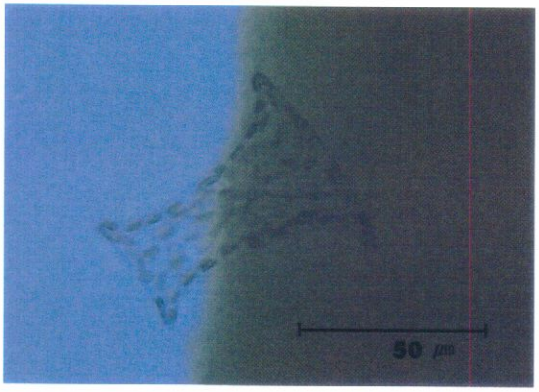


Prorocentrum sp. (Viable, Treated water)

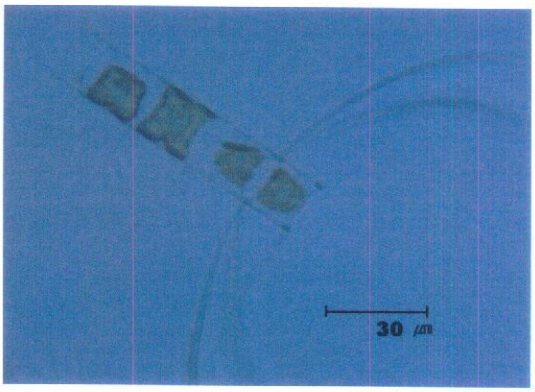
Light microscope image (left) and auto-fluorescence microscope image (right).

2. To be continued

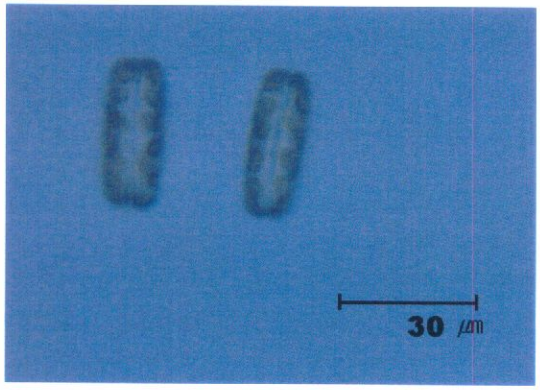
· **Ballasting (8th test cycle: 2011. 11. 09)**



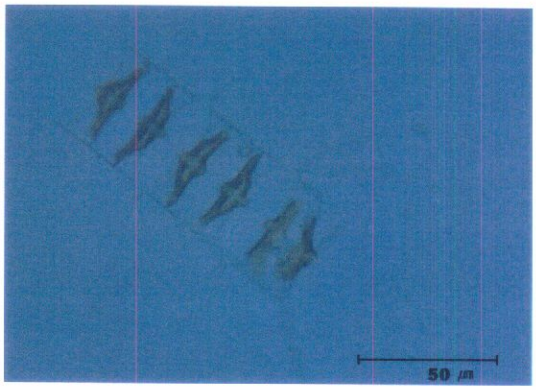
Eucampia sp. (Test water)



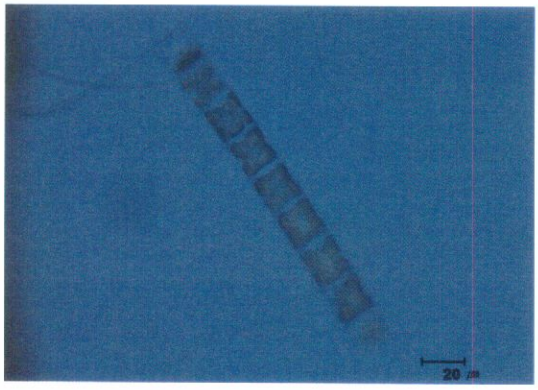
Chaetoceros sp. (Test water)



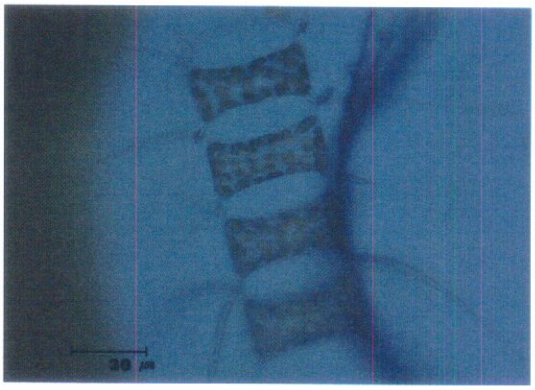
Thalassiosira sp. (Test water)



Chaetoceros sp. (Test water)



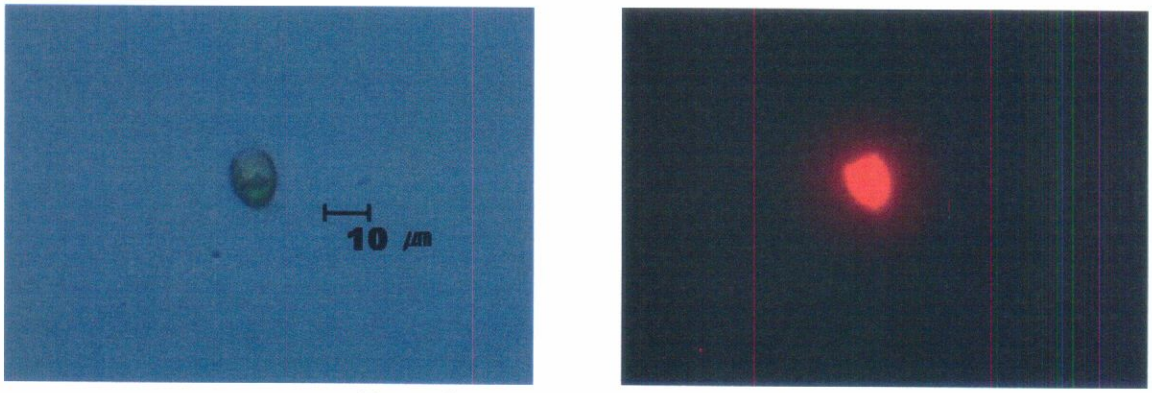
Chaetoceros sp. (Test water)



Chaetoceros sp. (Test water)

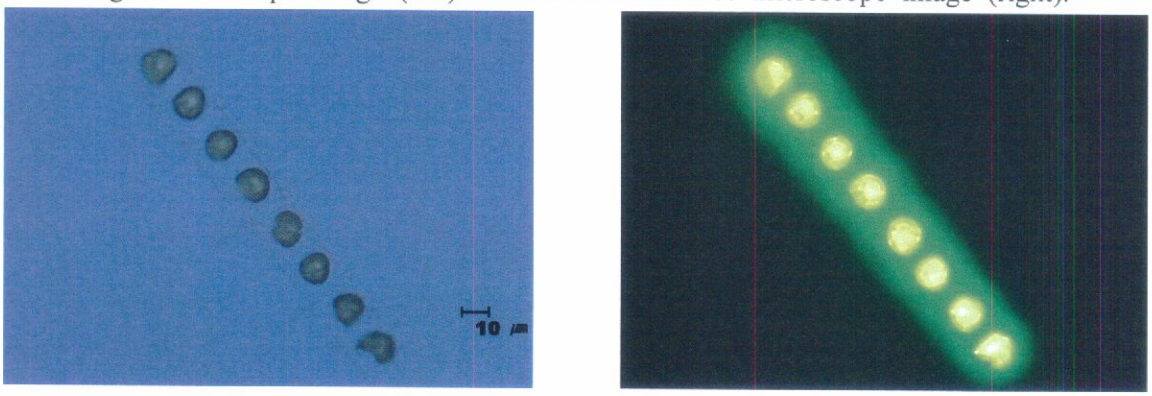
2. To be continued

· **Ballasting (8th test cycle: 2011. 11. 09)**



Tetraselmis suecica (Control water)

Light microscope image (left) and auto-fluorescence microscope image (right).



Chaetoceros sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).

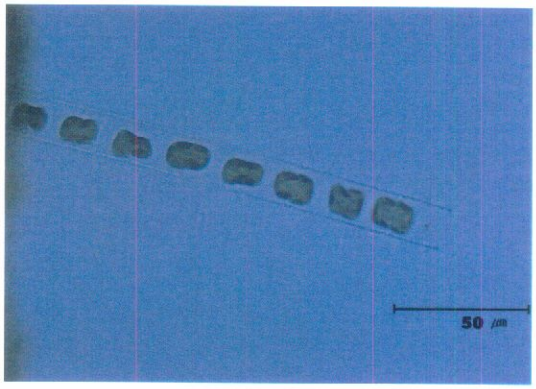
Tetraselmis suecica (Viable, Treated water)

Light microscope image (left) and auto-fluorescence microscope image (right).

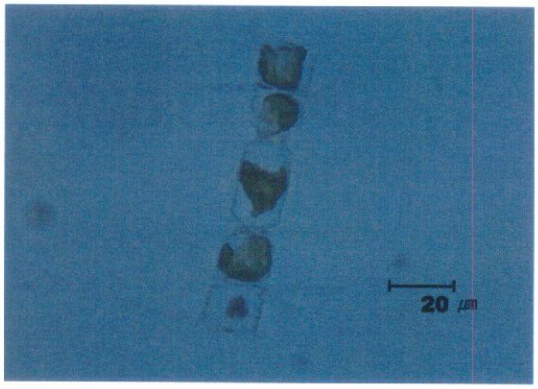
2. To be continued

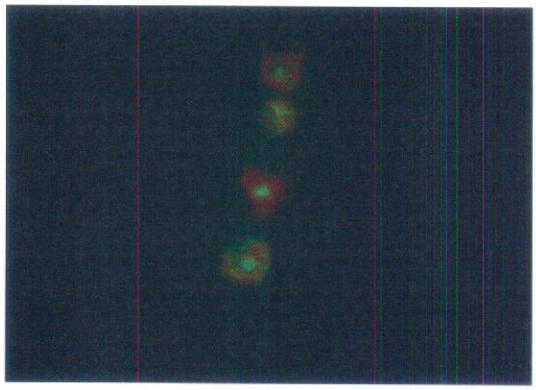
· **de-Ballasting (8th test cycle: 2011. 11. 14)**

Protoperidinium sp. (Control water)



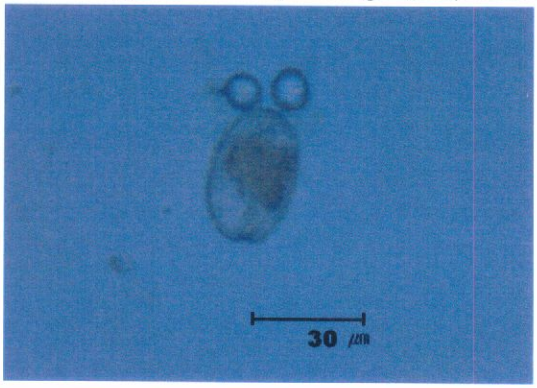
Chaetoceros sp. (Control water)

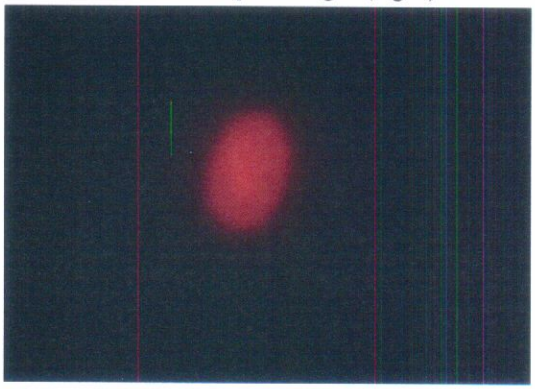




Chaetoceros sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).



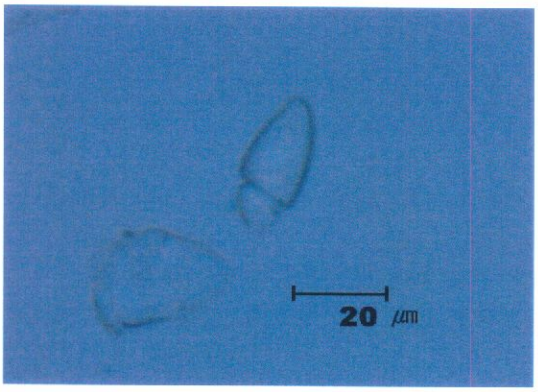


Prorocentrum sp. (Viable, Treated water)

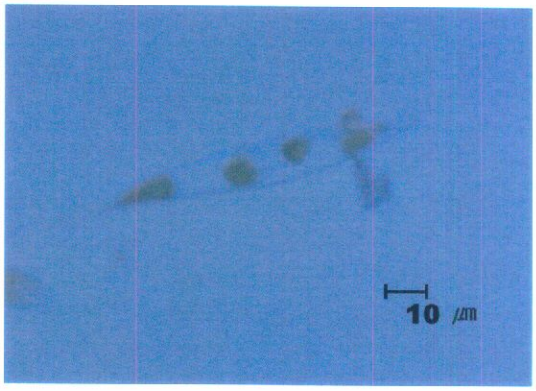
Light microscope image (left) and auto-fluorescence microscope image (right).

2. To be continued

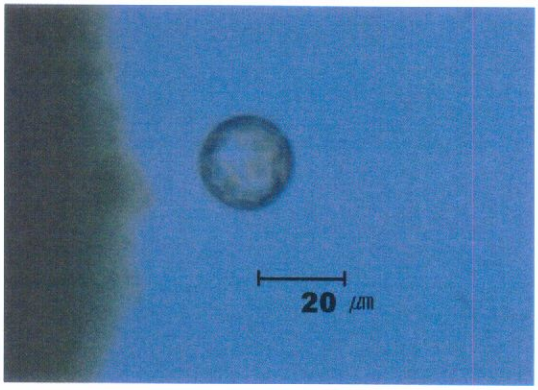
· **Ballasting (9th test cycle: 2011. 11. 16)**



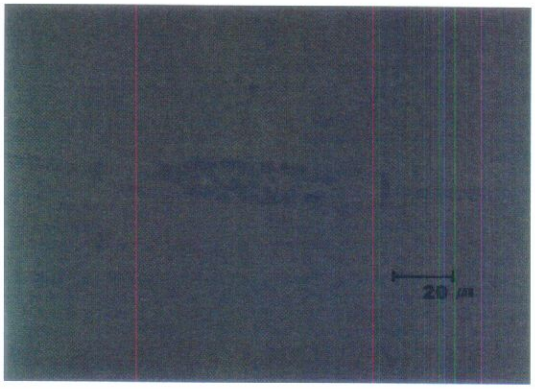
Katodinium glaucum (Test water)



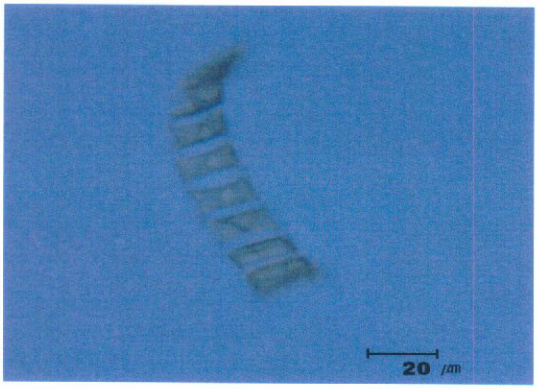
Pleurosigma sp. (Test water)



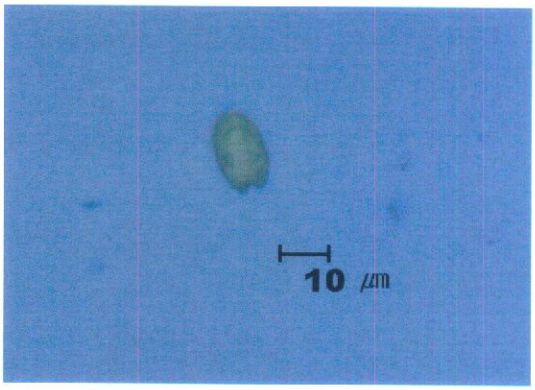
Thalassiosira sp. (Test water)



Ditylum brightwellii (Test water)



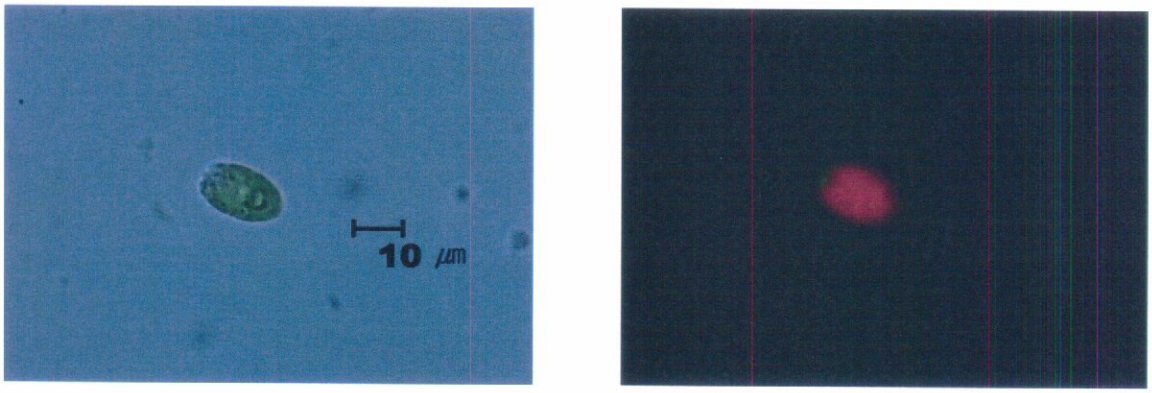
Chaetoceros sp. (Test water)



Tetraselmis suecica (Test water)

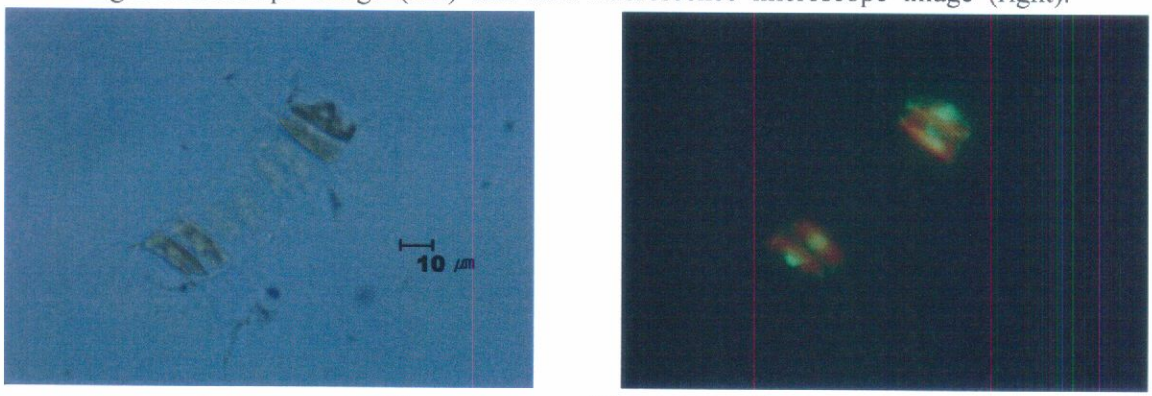
2. To be continued

· **Ballasting (9th test cycle: 2011. 11. 16)**



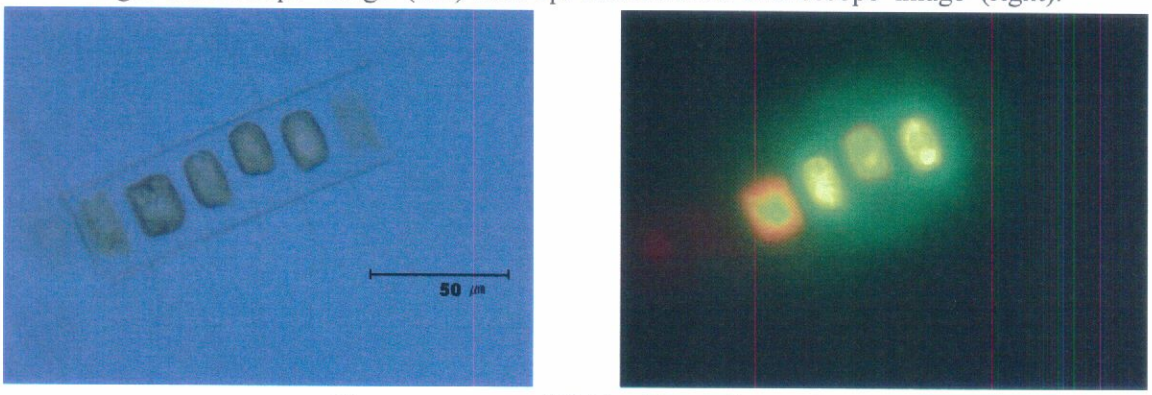
Tetraselmis suecica (Control water)

Light microscope image (left) and auto-fluorescence microscope image (right).



Chaetoceros sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).

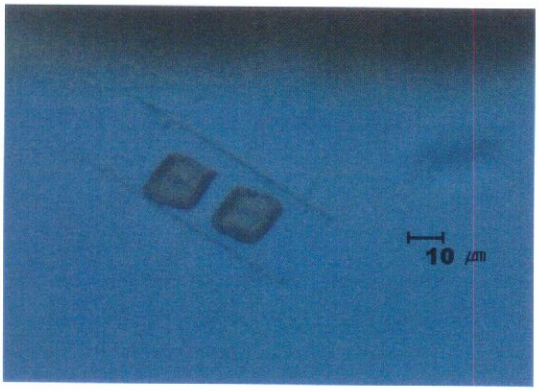


Chaetoceros sp. (Viable, Treated water)

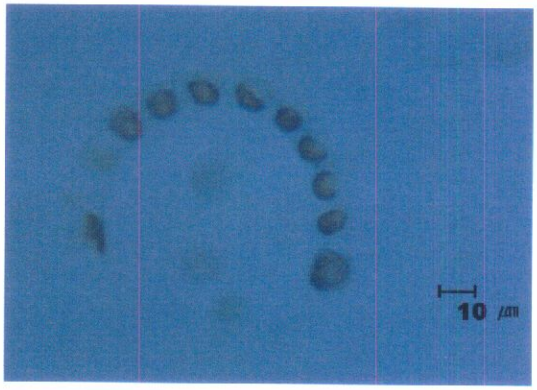
Light microscope image (left) and epi-fluorescence microscope image (right).

2. To be continued

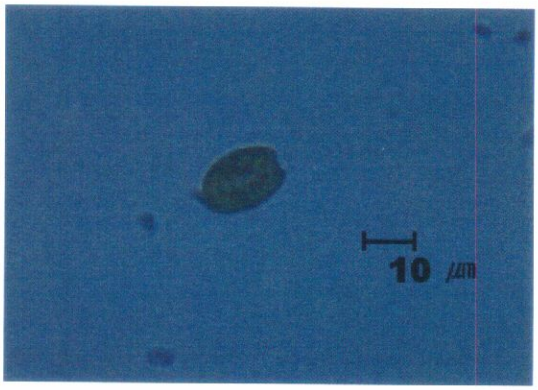
· **de-Ballasting (9th test cycle: 2011. 11. 21)**

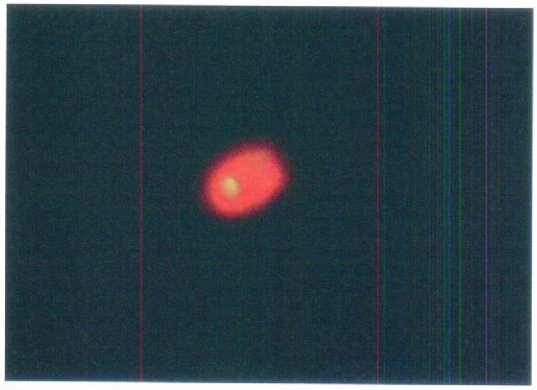


Chaetoceros sp. (Control water)



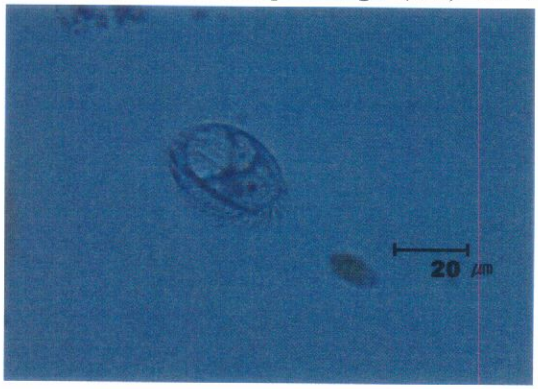
Chaetoceros sp. (Control water)

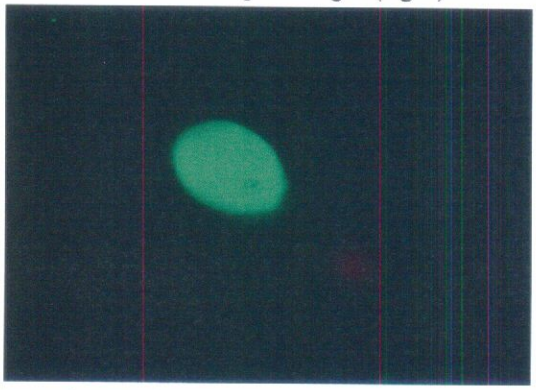




Tetraselmis suecica (Control water)

Light microscope image (left) and auto-fluorescence microscope image (right).



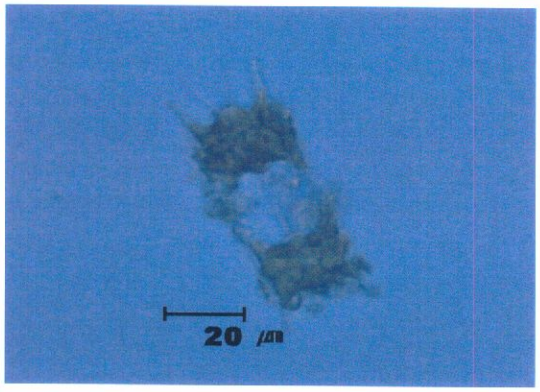


Protozoa (Viable, Treated water)

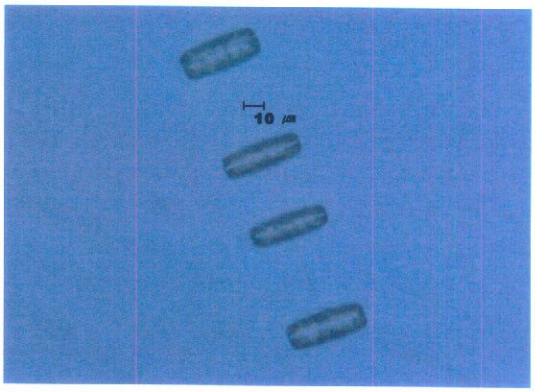
Light microscope image (left) and epi-fluorescence microscope image (right).

2. To be continued

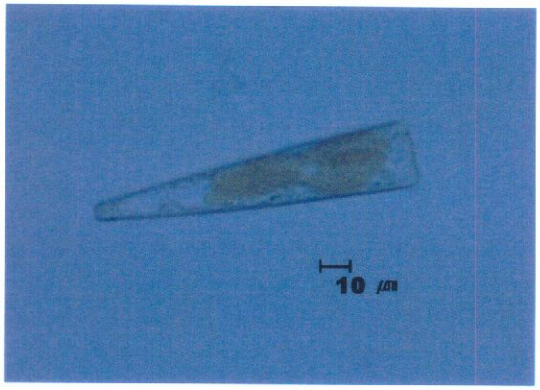
· **Ballasting (10th test cycle: 2011. 11. 23)**



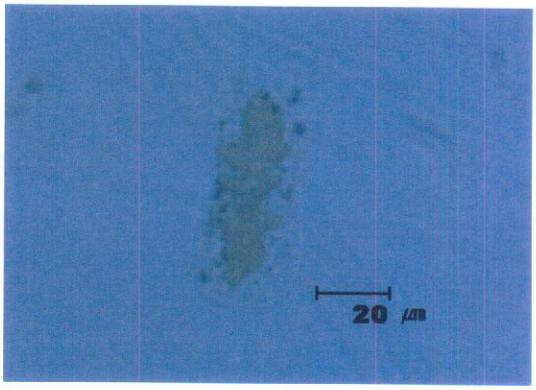
Odontella sp. (Test water)



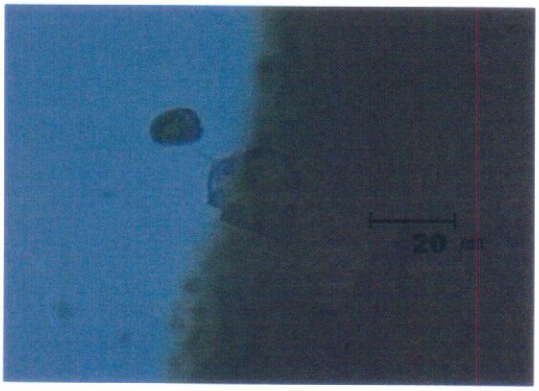
Thalassiosira sp. (Test water)



Licmophora sp. (Test water)



Entomoneis sp. (Test water)

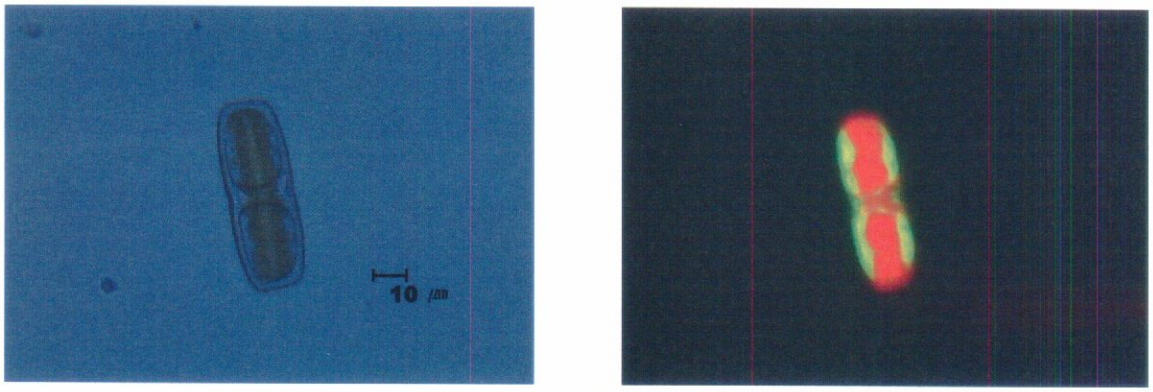


Gonyaulax sp. (Test water)

Chaetoceros sp. (Test water)

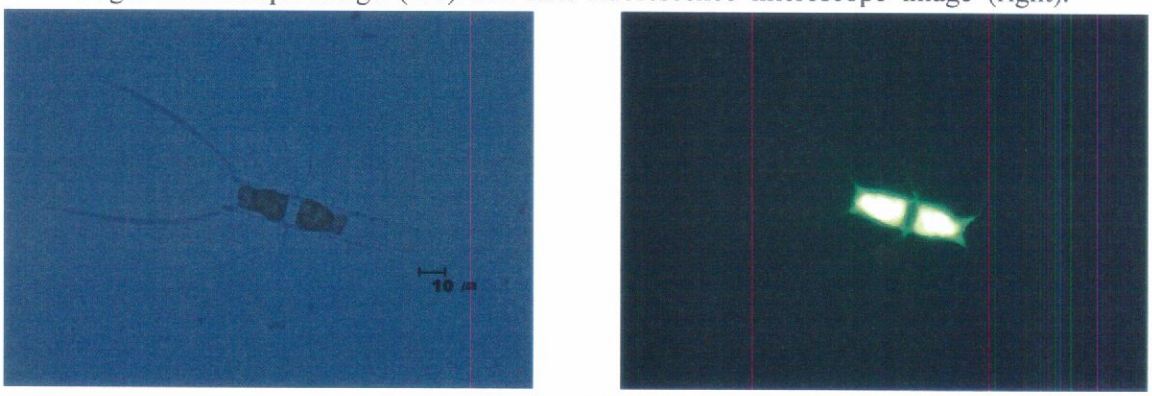
2. To be continued

· **Ballasting (10th test cycle: 2011. 11. 23)**



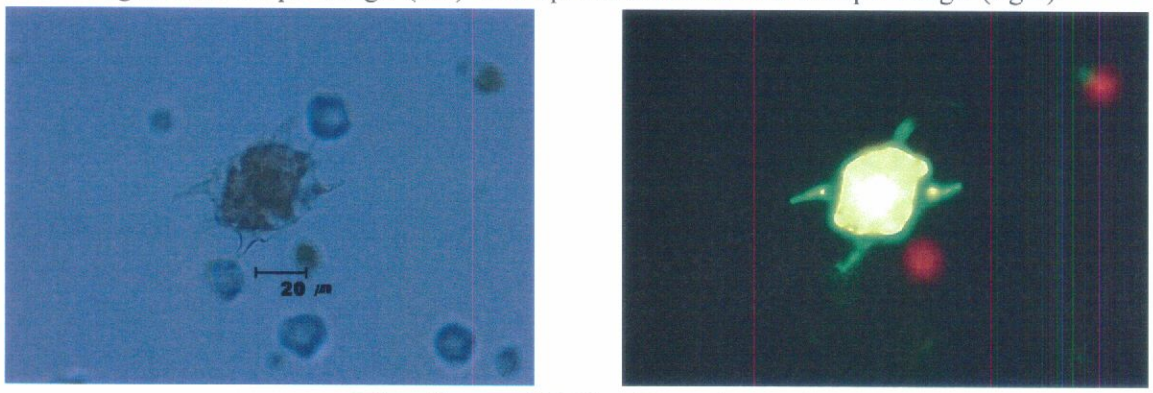
Pinnularia sp. (Control water)

Light microscope image (left) and auto-fluorescence microscope image (right).



Chaetoceros sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).

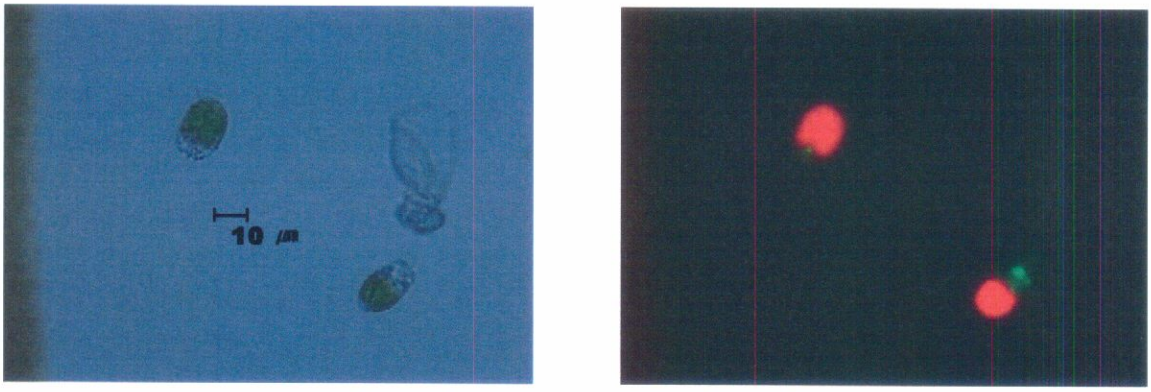


Odontella sp. (Viable, Treated water)

Light microscope image (left) and epi-fluorescence microscope image (right).

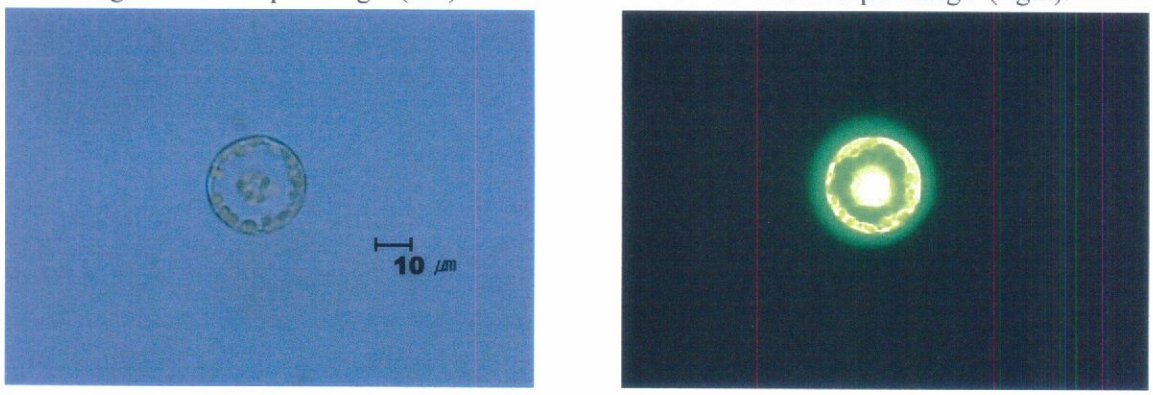
2. To be continued

· **de-Ballasting (10th test cycle: 2011. 11. 28)**



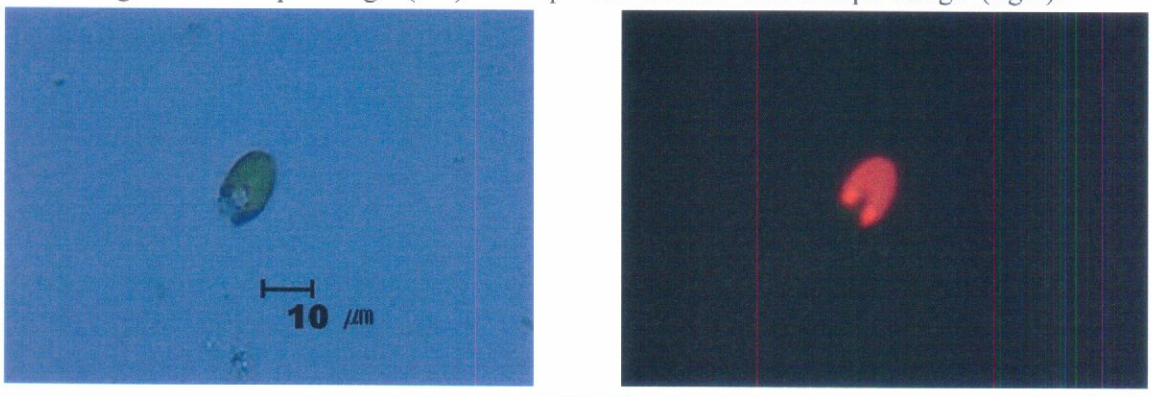
Tetraselmis suecica (Control water)

Light microscope image (left) and auto-fluorescence microscope image (right).



Thalassiosira sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).

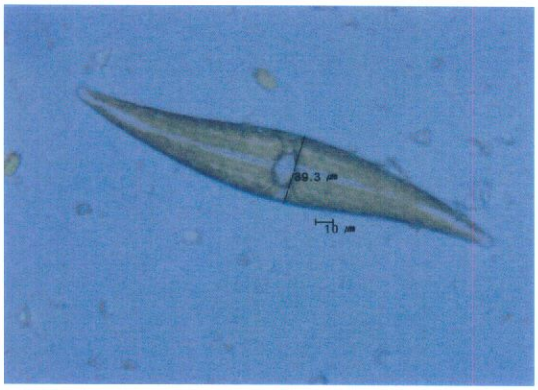


Tetraselmis suecica (Viable, Treated water)

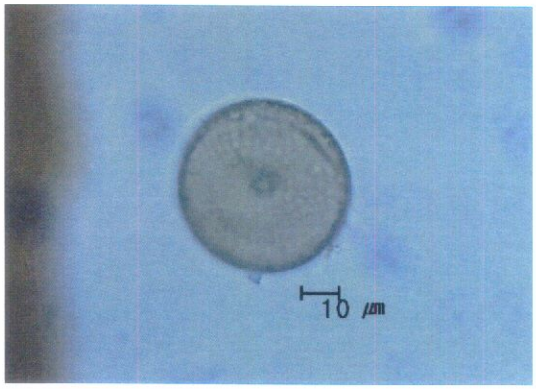
Light microscope image (left) and auto-fluorescence microscope image (right).

2. To be continued

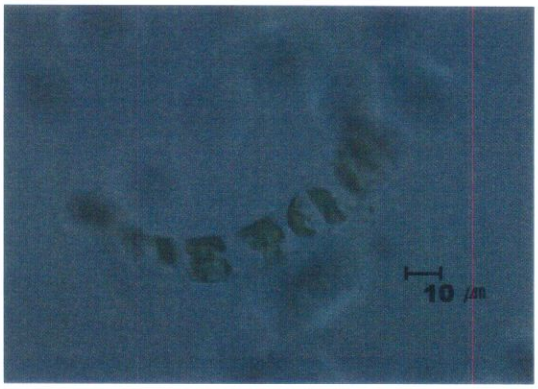
· **Ballasting (11th test cycle: 2011. 12. 07)**



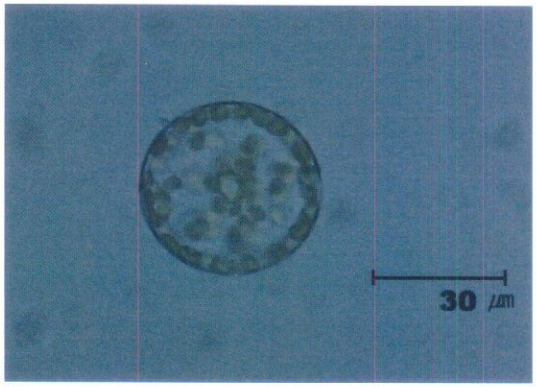
Pleurosigma sp. (Test water)



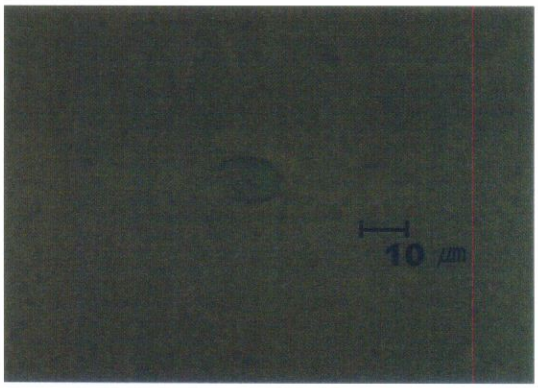
Thalassiosira sp. (Test water)



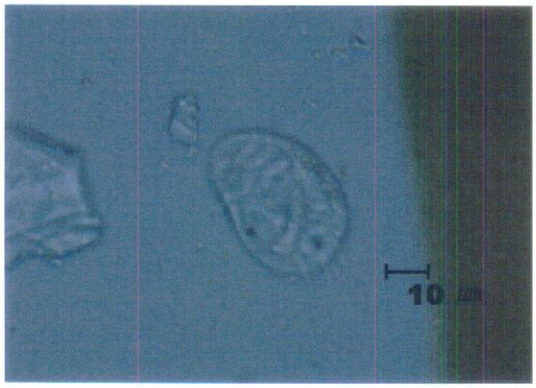
Chaetoceros sp. (Test water)



Thalassiosira sp. (Test water)



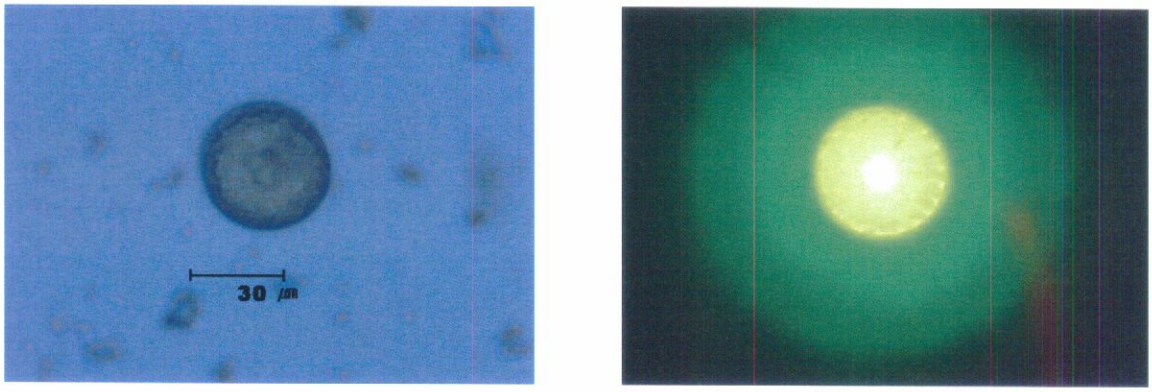
Tetraselmis suecica (Test water)



Protozoa (Test water)

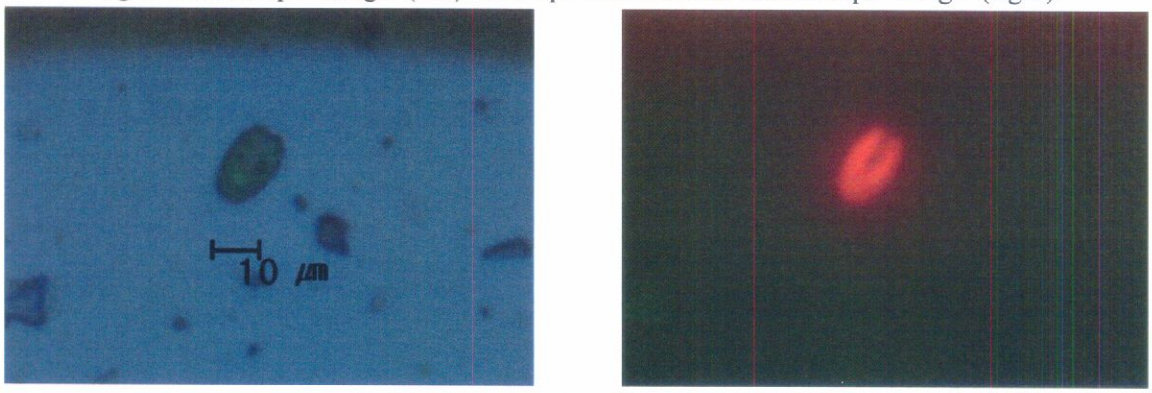
2. To be continued

· **Ballasting (11th test cycle: 2011. 12. 07)**



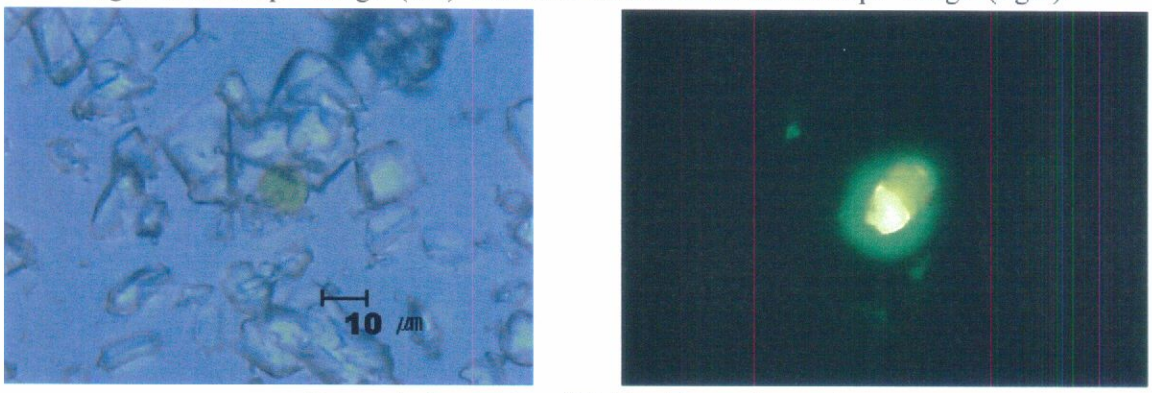
Thalassiosira sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).



Tetraselmis suecica (Control water)

Light microscope image (left) and auto-fluorescence microscope image (right).

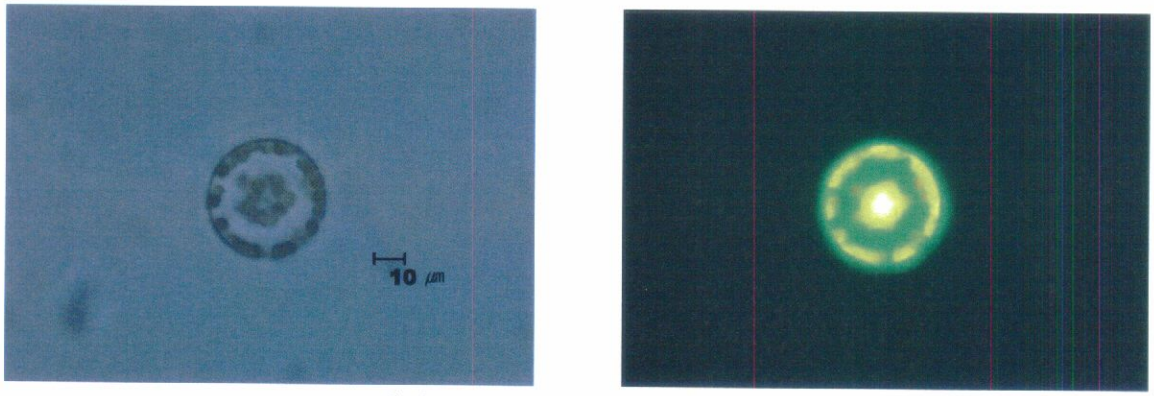


Tetraselmis suecica (Viable, Treated water)

Light microscope image (left) and epi-fluorescence microscope image (right).

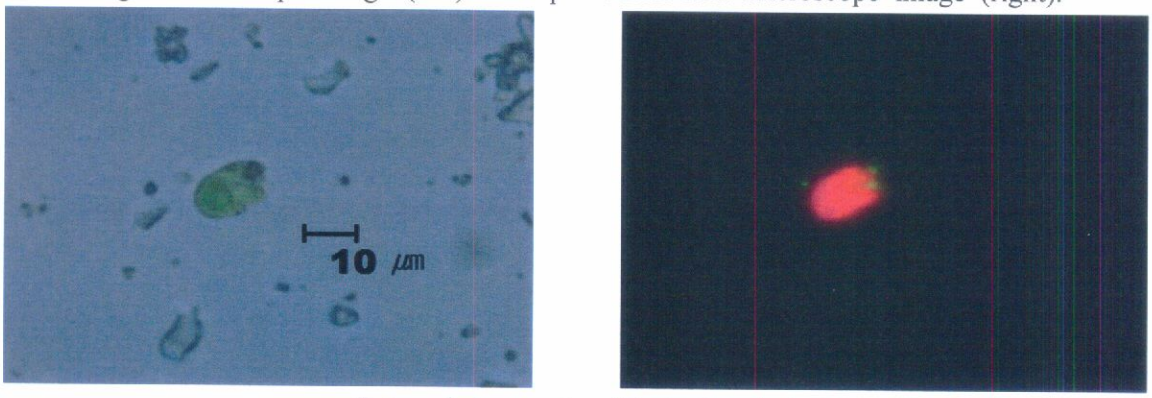
2. To be continued

· **de-Ballasting (11th test cycle: 2011. 12. 12)**



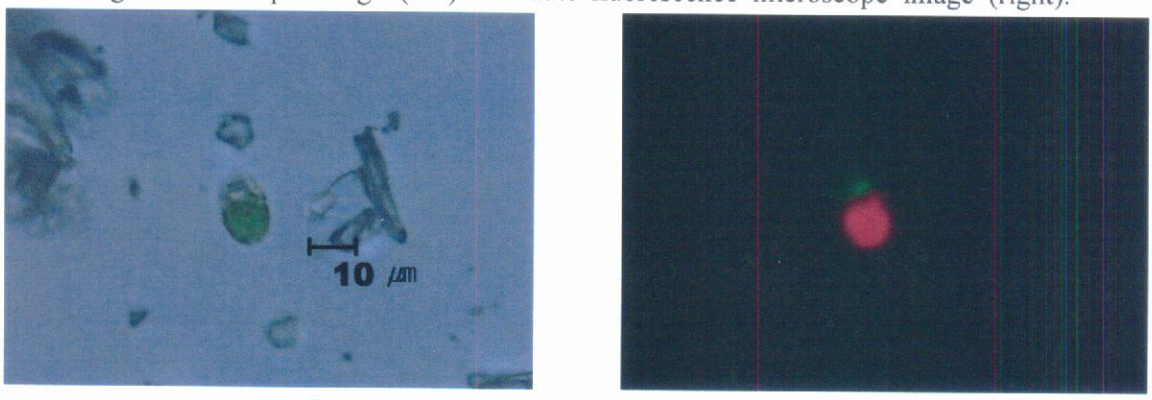
Thalassiosira sp. (Control water)

Light microscope image (left) and epi-fluorescence microscope image (right).



Tetraselmis suecica (Control water)

Light microscope image (left) and auto-fluorescence microscope image (right).

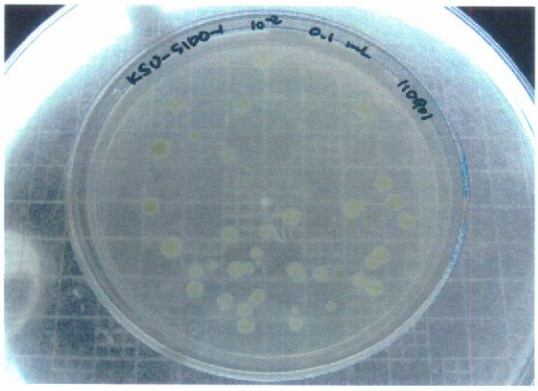


Tetraselmis suecica (Viable, Treated water)

Light microscope image (left) and auto-fluorescence microscope image (right).

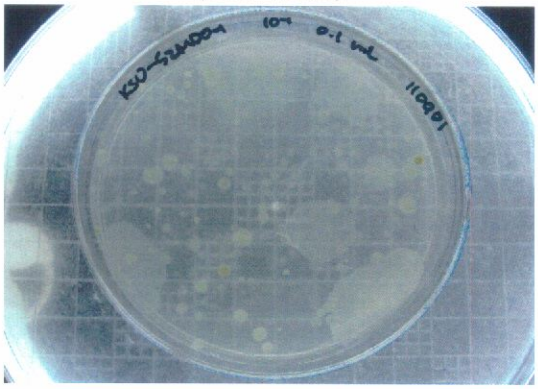
3. Bacteria

· **Ballasting (1st test cycle: 2011. 09. 01)**



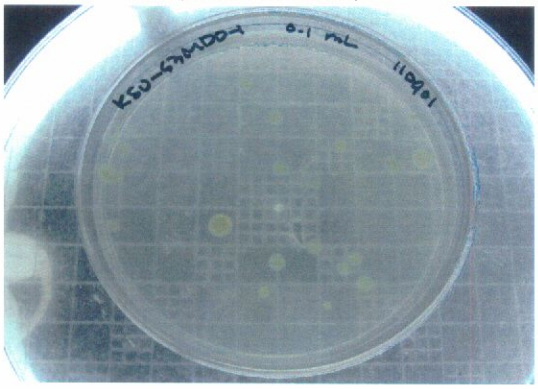
Heterotrophic bacteria
(Test water)

Total coliform
(Test water)

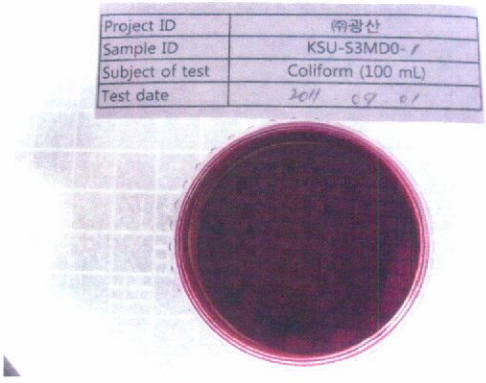


Heterotrophic bacteria
(Control water)

Total coliform
(Control water)



Heterotrophic bacteria
(Treated water)

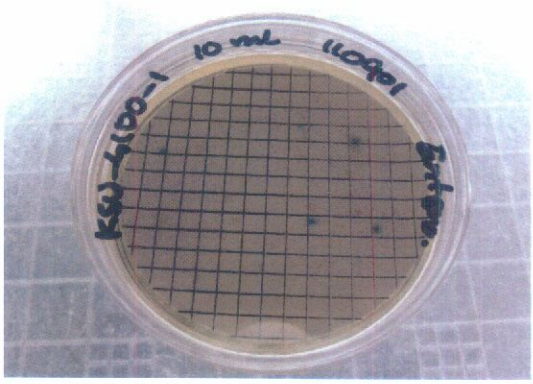


Total coliform
(Treated water)

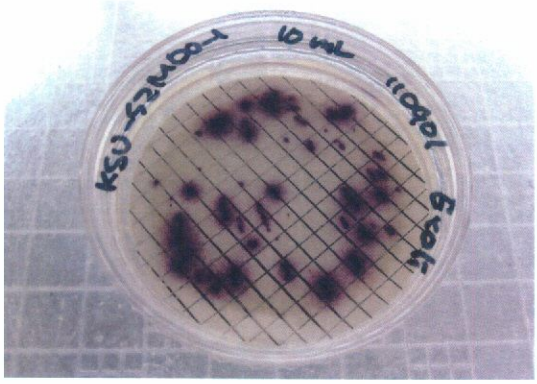
3. To be continued

· **Ballasting (1st test cycle: 2011. 09. 01)**

Escherichia coli
(Test water)

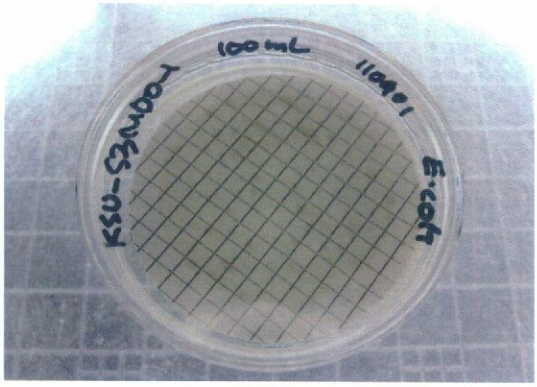


Intestinal Enterococci
(Test water)



Escherichia coli
(Control water)

Intestinal Enterococci
(Control water)

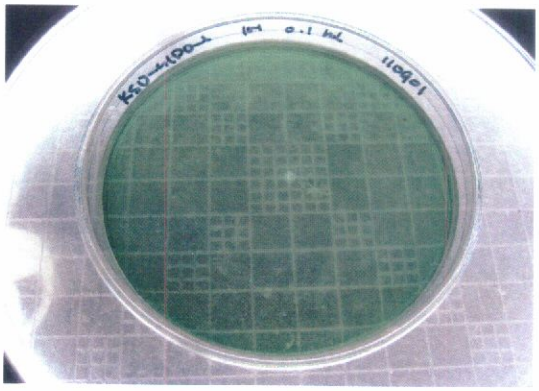


Escherichia coli
(Treated water)

Intestinal Enterococci
(Treated water)

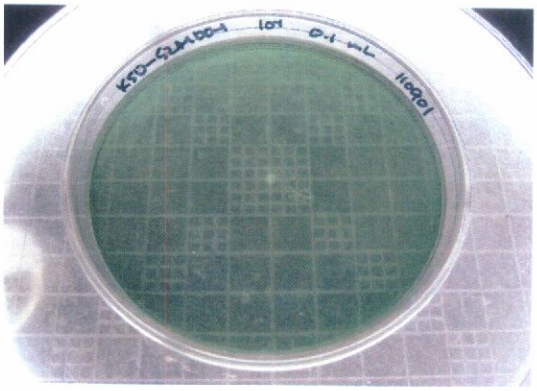
3. To be continued

· **Ballasting (1st test cycle: 2011. 09. 01)**



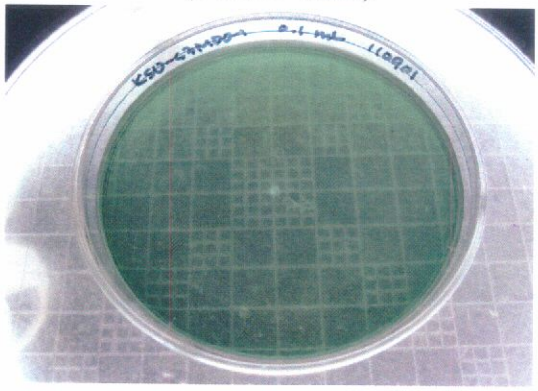
Toxicogenic *V. cholerae*

(Test water)



Toxicogenic *V. cholerae*

(Control water)

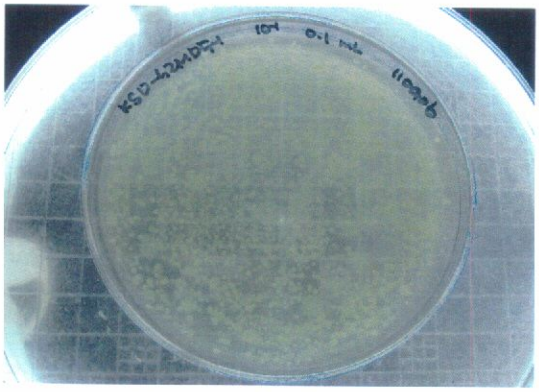


Toxicogenic *V. cholerae*

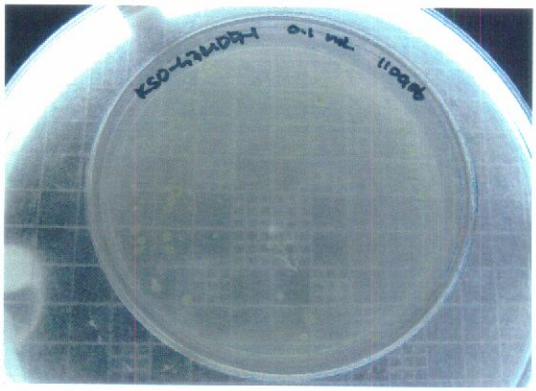
(Treated water)

3. To be continued

· de-Ballasting (1st test cycle: 2011. 09. 06)

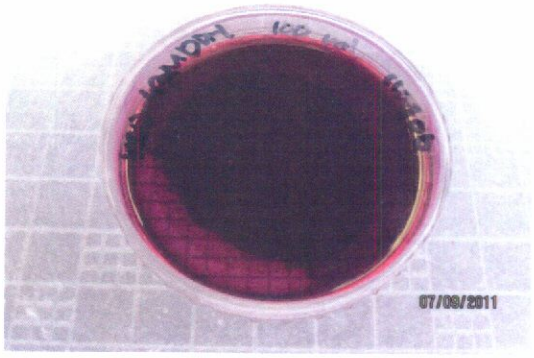


Heterotrophic bacteria
(Control water)



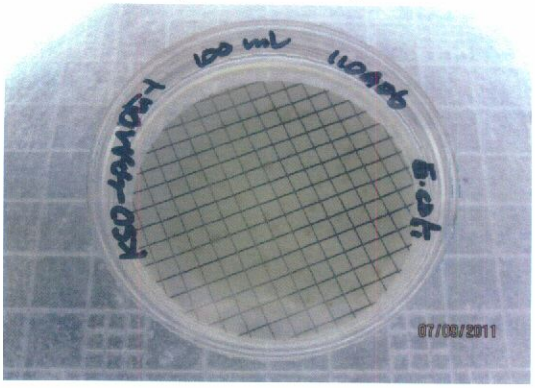
Heterotrophic bacteria
(Treated water)

Total coliform
(Control water)



Total coliform
(Treated water)

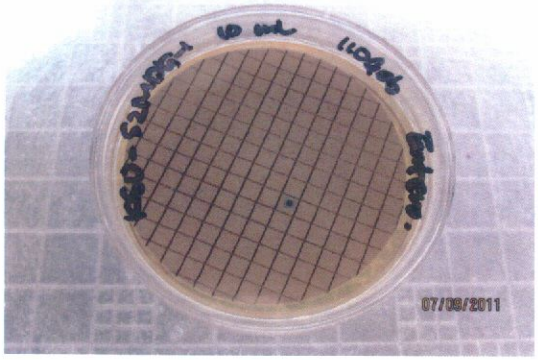
Escherichia coli
(Control water)



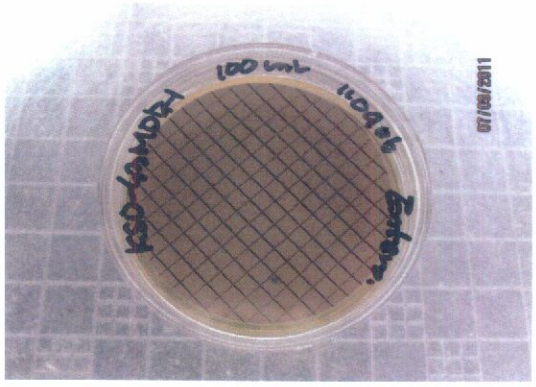
Escherichia coli
(Treated water)

3. To be continued

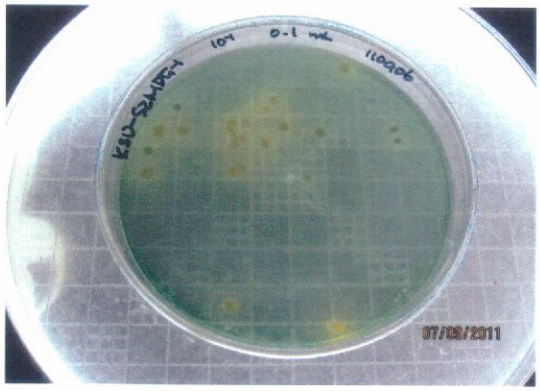
· **de-Ballasting (1st test cycle: 2011. 09. 06)**



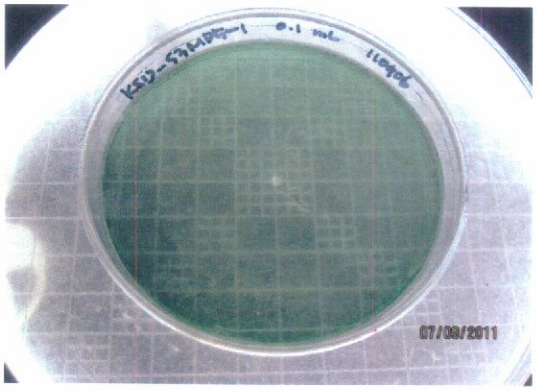
Intestinal Enterococci
(Control water)



Intestinal Enterococci
(Treated water)



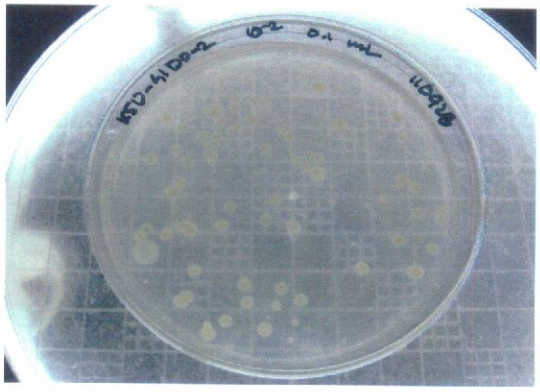
Toxicogenic *V. cholerae*
(Control water)



Toxicogenic *V. cholerae*
(Treated water)

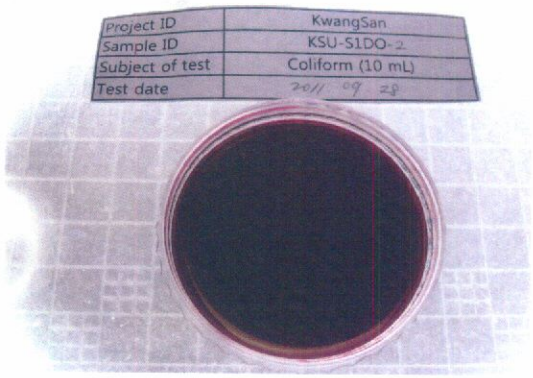
3. To be continued

· **Ballasting (2nd test cycle: 2011. 09. 28)**



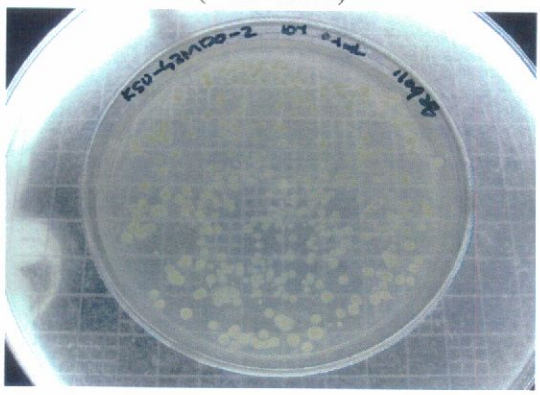
Heterotrophic bacteria

(Test water)



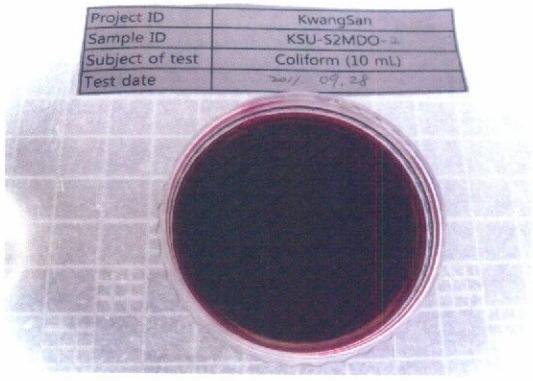
Total coliform

(Test water)



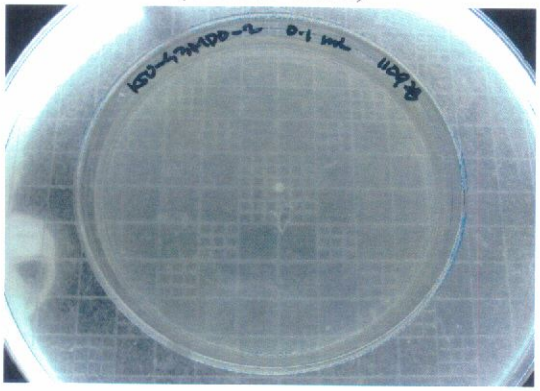
Heterotrophic bacteria

(Control water)



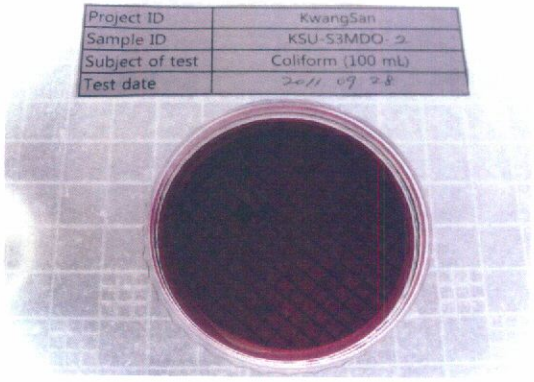
Total coliform

(Control water)



Heterotrophic bacteria

(Treated water)



Total coliform

(Treated water)

3. To be continued

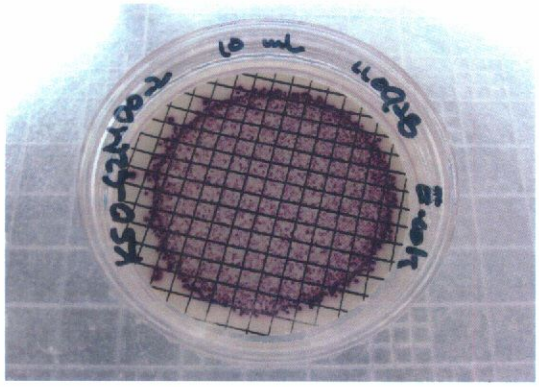
· **Ballasting (2nd test cycle: 2011. 09. 28)**

Escherichia coli

(Test water)

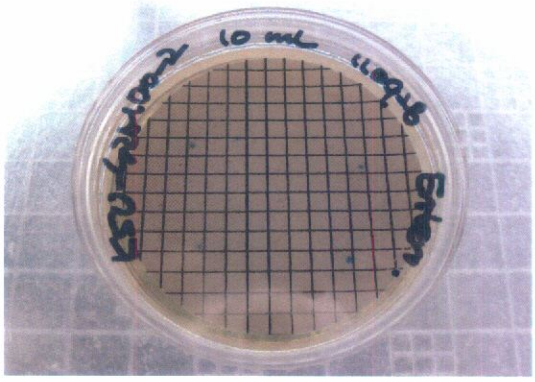
Intestinal Enterococci

(Test water)



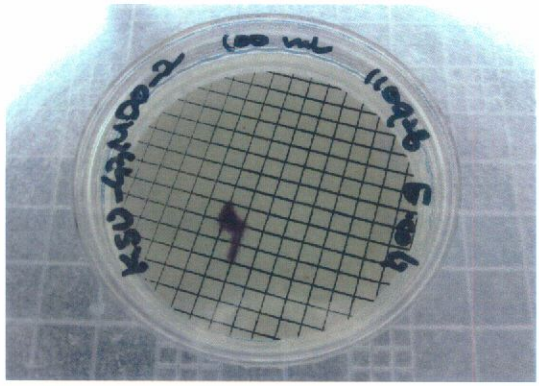
Escherichia coli

(Control water)



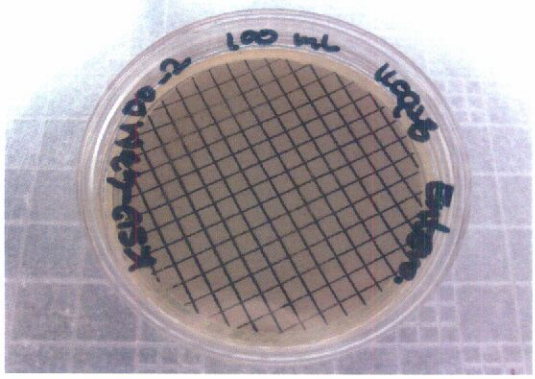
Intestinal Enterococci

(Control water)



Escherichia coli

(Treated water)

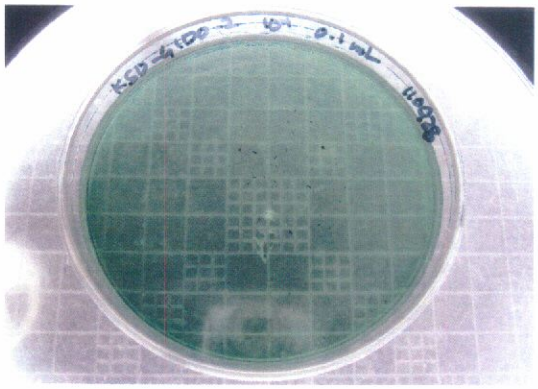


Intestinal Enterococci

(Treated water)

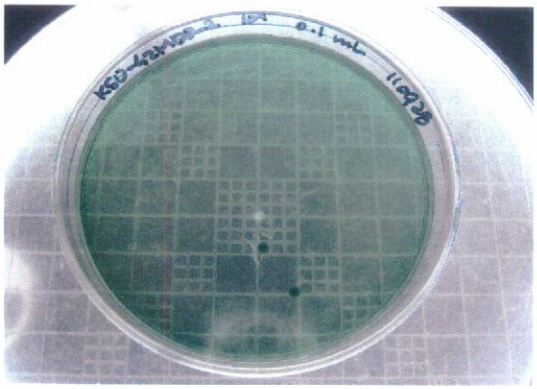
3. To be continued

· **Ballasting (2nd test cycle: 2011. 09. 28)**



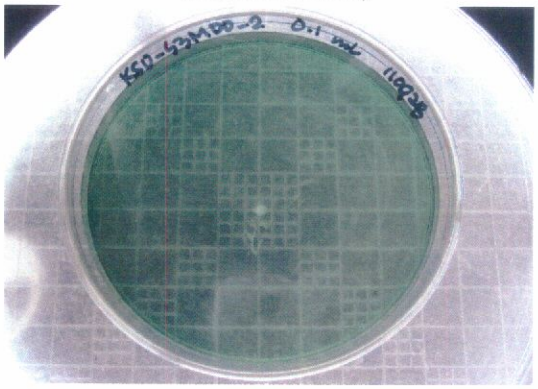
Toxicogenic *V. cholerae*

(Test water)



Toxicogenic *V. cholerae*

(Control water)

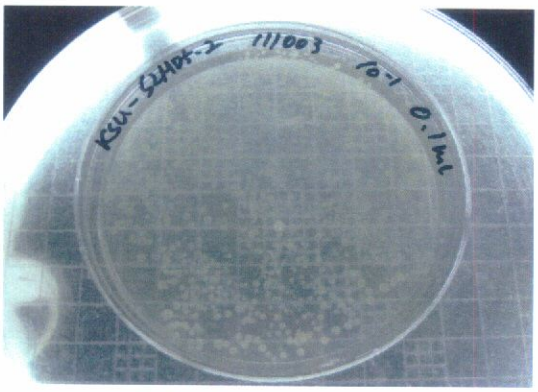


Toxicogenic *V. cholerae*

(Treated water)

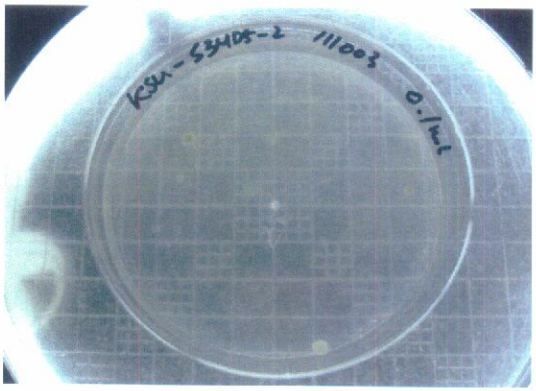
3. To be continued

· **de-Ballasting (2nd test cycle: 2011. 10. 03)**



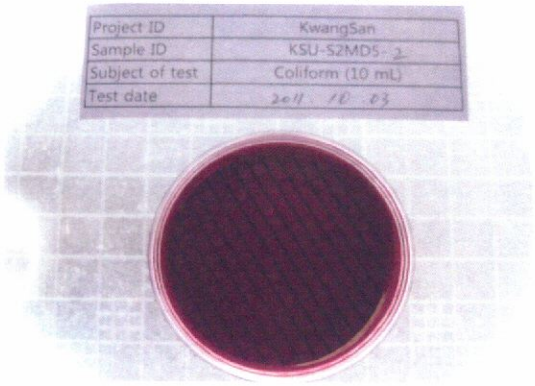
Heterotrophic bacteria

(Control water)



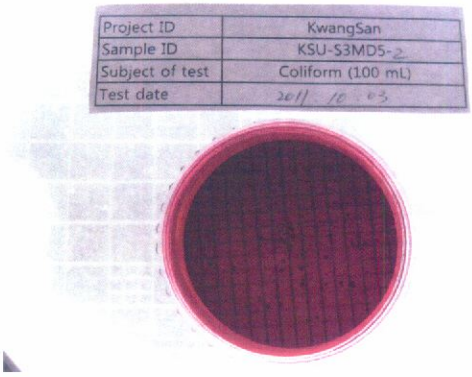
Heterotrophic bacteria

(Treated water)



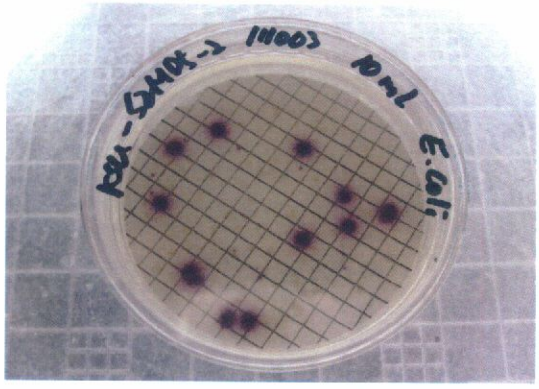
Total coliform

(Control water)



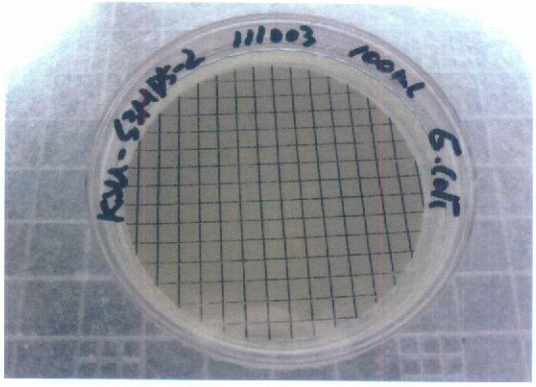
Total coliform

(Treated water)



Escherichia coli

(Control water)

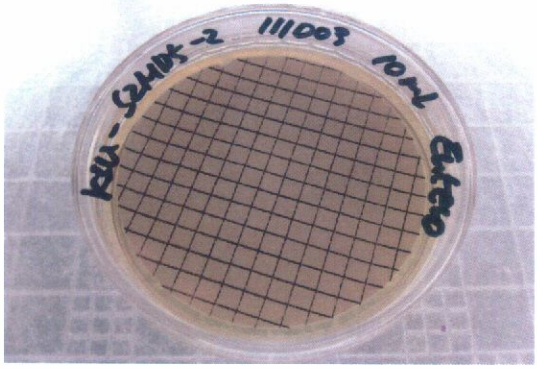


Escherichia coli

(Treated water)

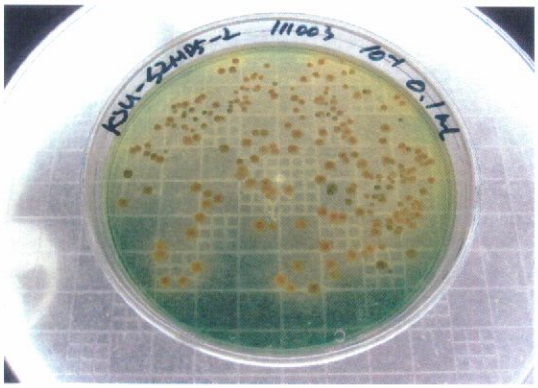
3. To be continued

· **de-Ballasting (2nd test cycle: 2011. 10. 03)**

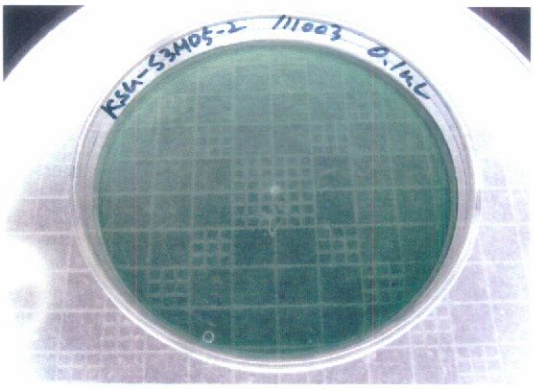


Intestinal Enterococci
(Control water)

Intestinal Enterococci
(Treated water)



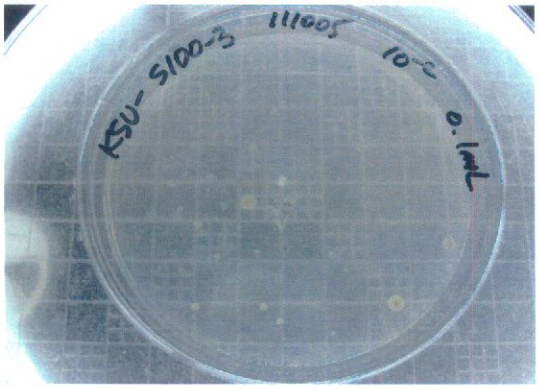
Toxicogenic *V. cholerae*
(Control water)



Toxicogenic *V. cholerae*
(Treated water)

3. To be continued

· **Ballasting (3rd test cycle: 2011. 10. 05)**

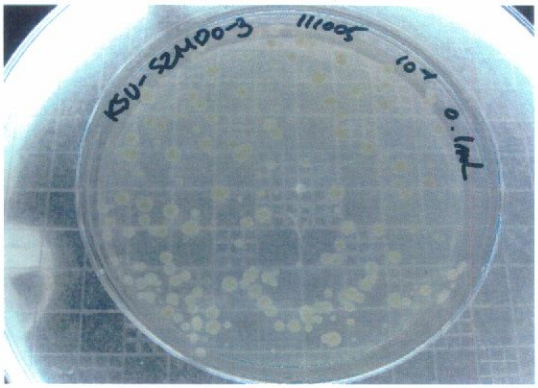


Heterotrophic bacteria

(Test water)

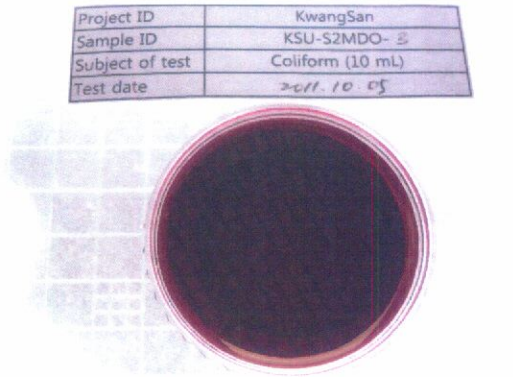
Total coliform

(Test water)



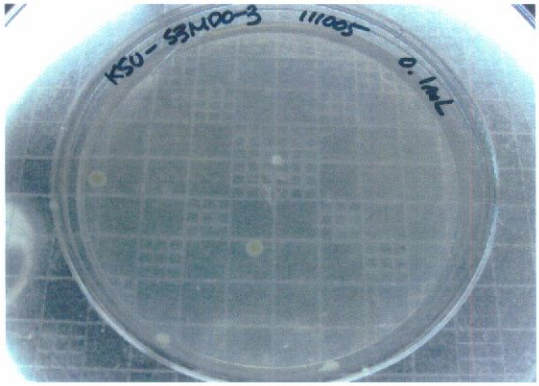
Heterotrophic bacteria

(Control water)



Total coliform

(Control water)



Heterotrophic bacteria

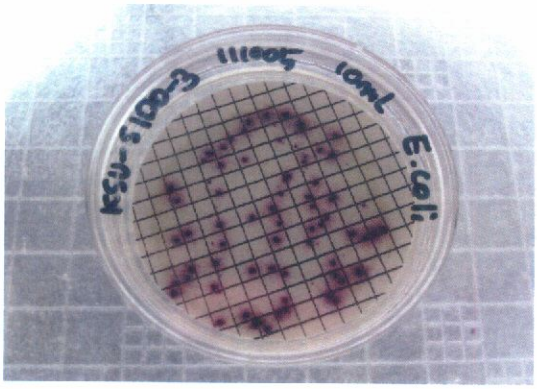
(Treated water)

Total coliform

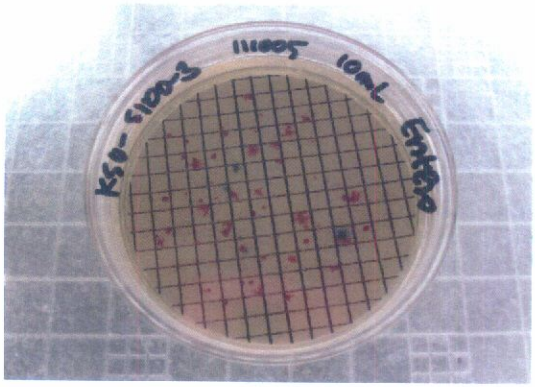
(Treated water)

3. To be continued

· **Ballasting (3rd test cycle: 2011. 10. 05)**



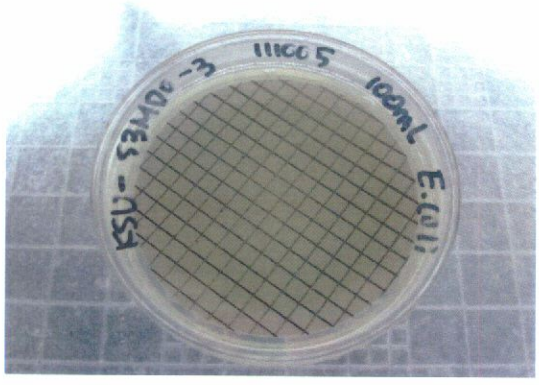
Escherichia coli
(Test water)



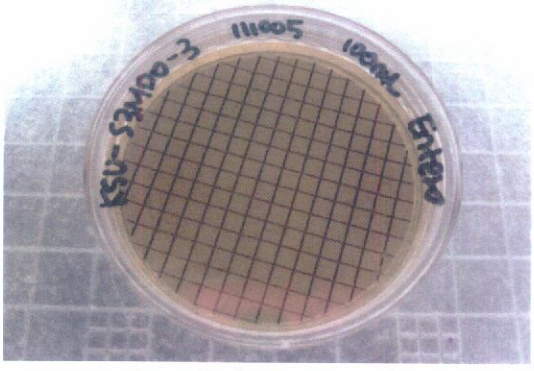
Intestinal Enterococci
(Test water)

Escherichia coli
(Control water)

Intestinal Enterococci
(Control water)



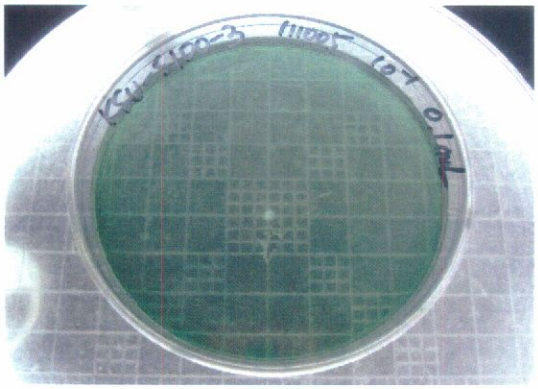
Escherichia coli
(Treated water)



Intestinal Enterococci
(Treated water)

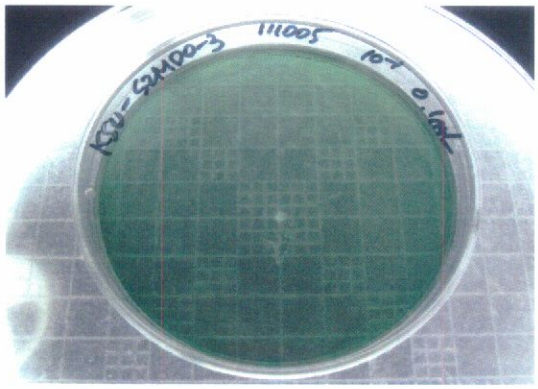
3. To be continued

· **Ballasting (3rd test cycle: 2011. 10. 05)**



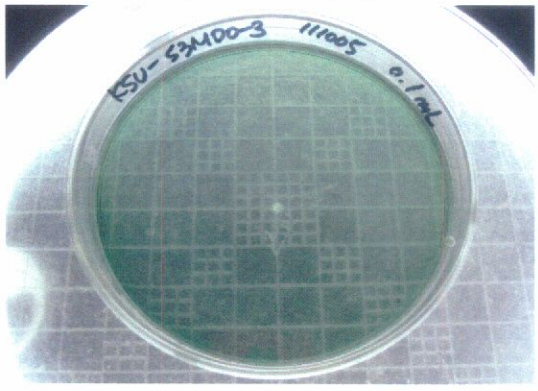
Toxicogenic *V. cholerae*

(Test water)



Toxicogenic *V. cholerae*

(Control water)

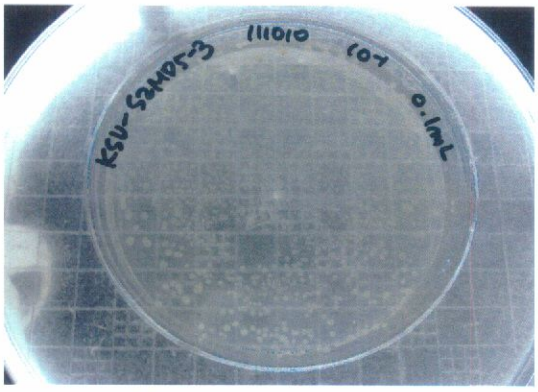


Toxicogenic *V. cholerae*

(Treated water)

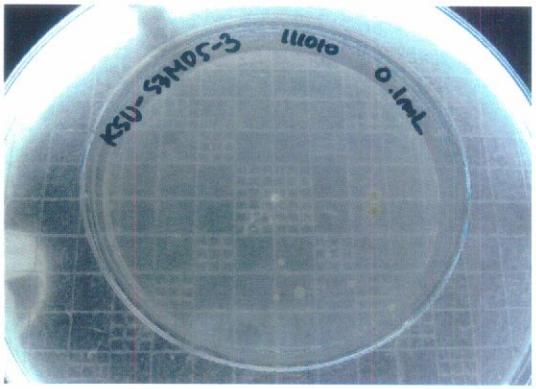
3. To be continued

· **de-Ballasting (3rd test cycle: 2011. 10. 10)**



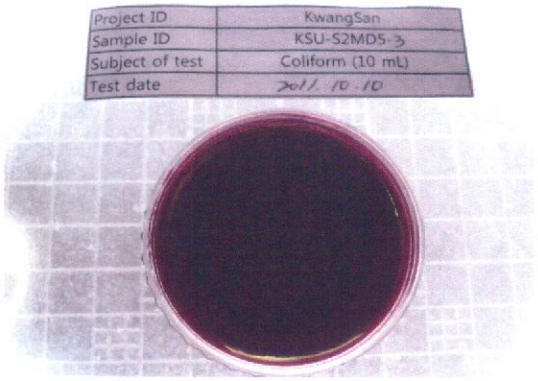
Heterotrophic bacteria

(Control water)



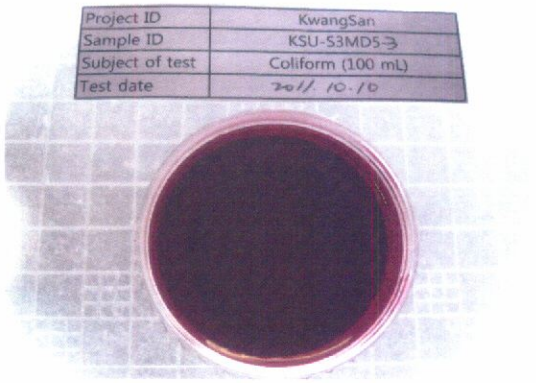
Heterotrophic bacteria

(Treated water)



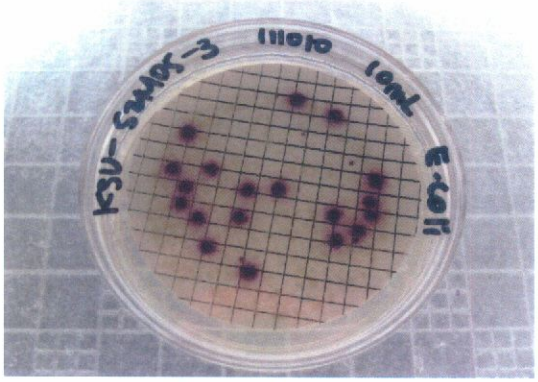
Total coliform

(Control water)



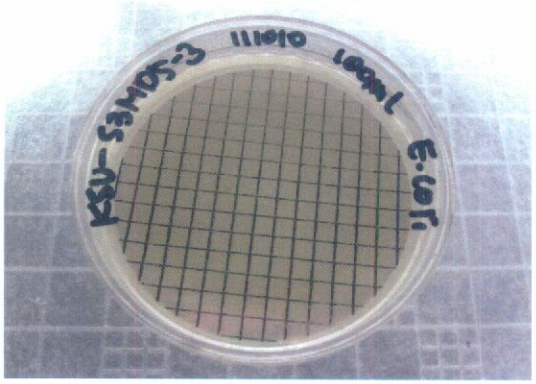
Total coliform

(Treated water)



Escherichia coli

(Control water)

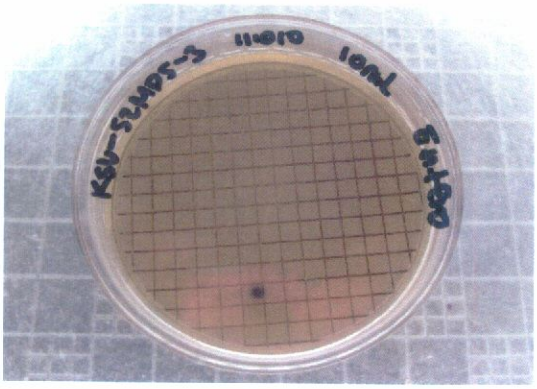


Escherichia coli

(Treated water)

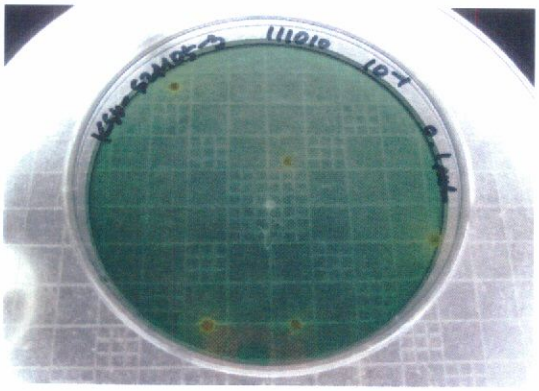
3. To be continued

· **de-Ballasting (3rd test cycle: 2011. 10. 10)**

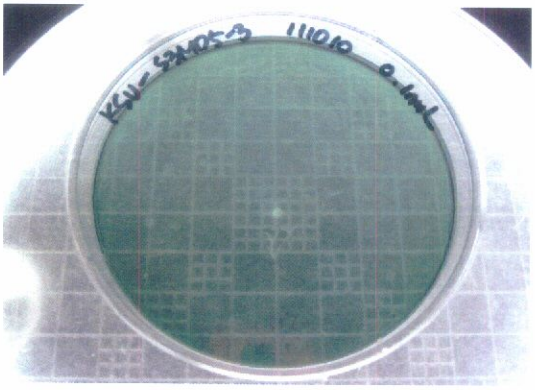


Intestinal Enterococci
(Control water)

Intestinal Enterococci
(Treated water)



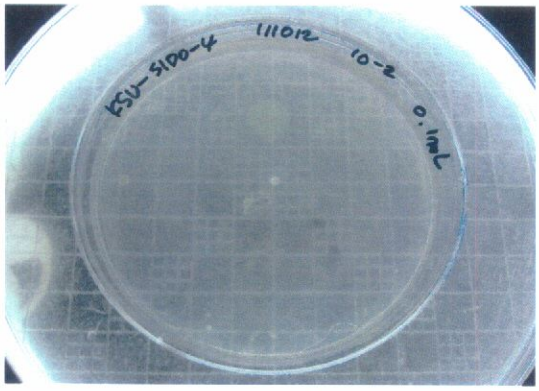
Toxicogenic *V. cholerae*
(Control water)



Toxicogenic *V. cholerae*
(Treated water)

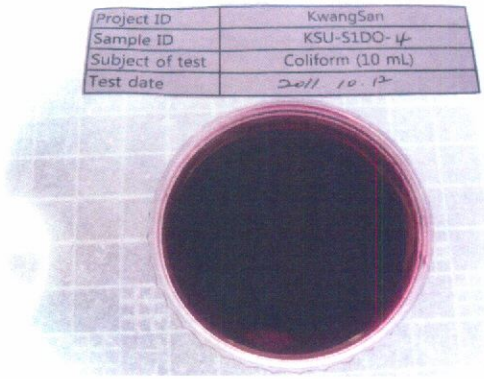
3. To be continued

· **Ballasting (4th test cycle: 2011. 10. 12)**



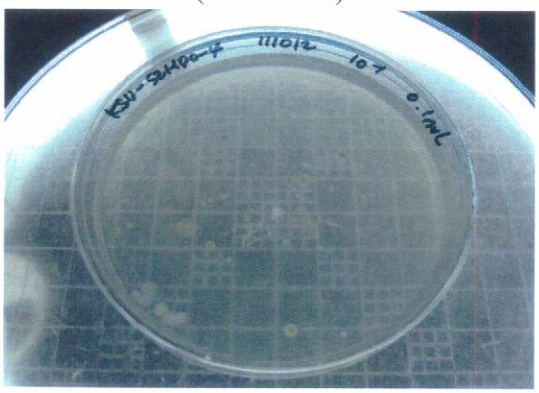
Heterotrophic bacteria

(Test water)



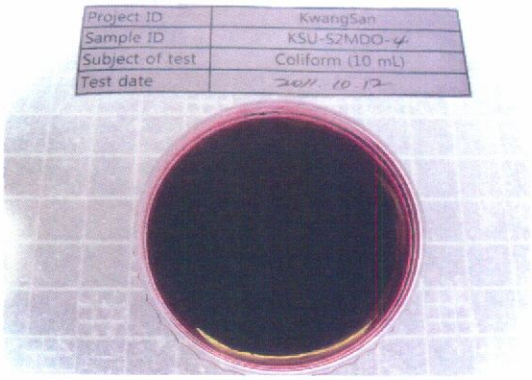
Total coliform

(Test water)



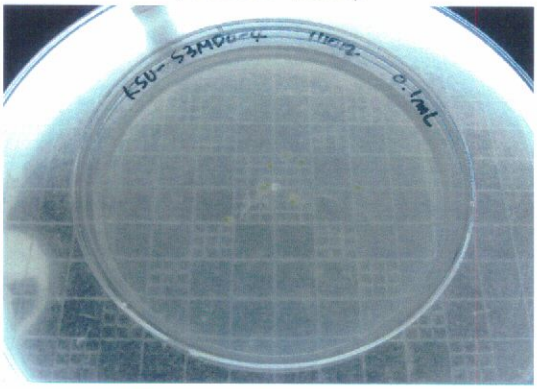
Heterotrophic bacteria

(Control water)



Total coliform

(Control water)



Heterotrophic bacteria

(Treated water)

Total coliform

(Treated water)

3. To be continued

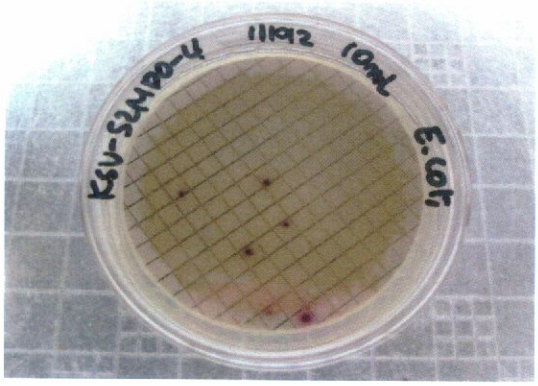
· **Ballasting (4th test cycle: 2011. 10. 12)**

Escherichia coli

(Test water)

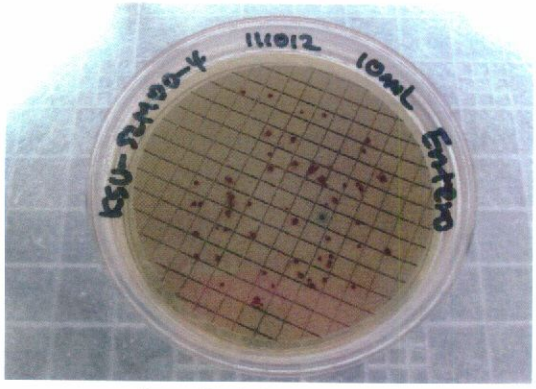
Intestinal Enterococci

(Test water)



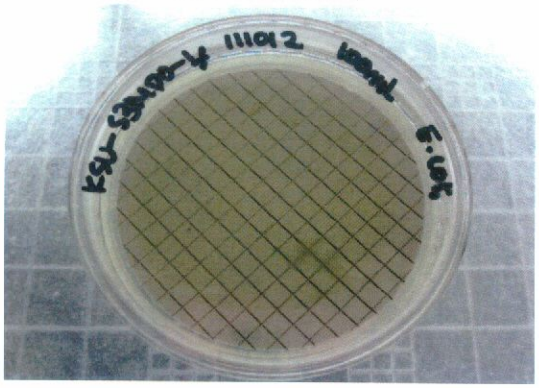
Escherichia coli

(Control water)



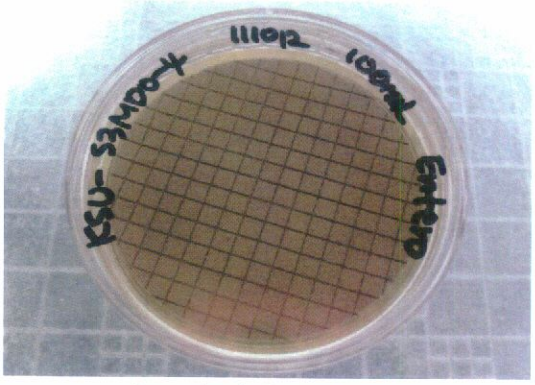
Intestinal Enterococci

(Control water)



Escherichia coli

(Treated water)

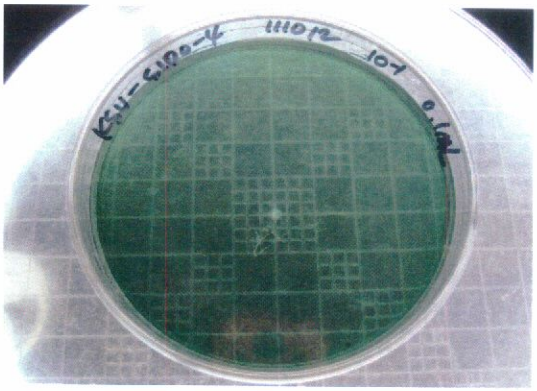


Intestinal Enterococci

(Treated water)

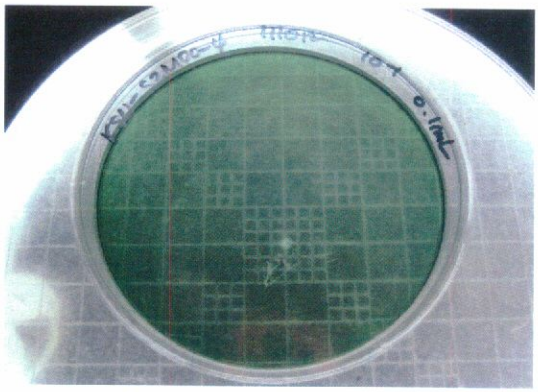
3. To be continued

· **Ballasting (4th test cycle: 2011. 10. 12)**



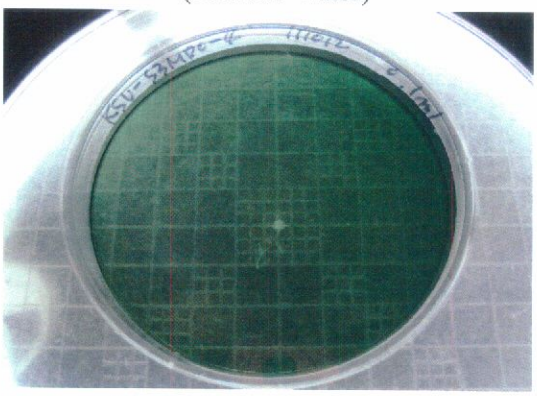
Toxicogenic *V. cholerae*

(Test water)



Toxicogenic *V. cholerae*

(Control water)

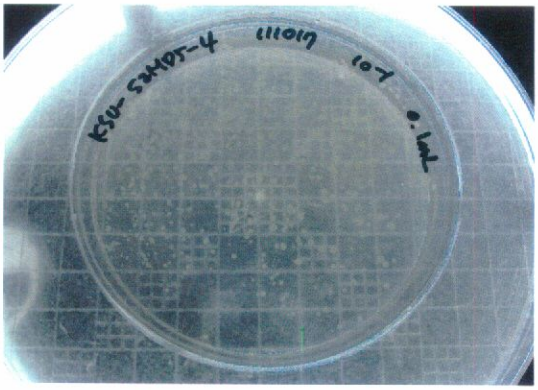


Toxicogenic *V. cholerae*

(Treated water)

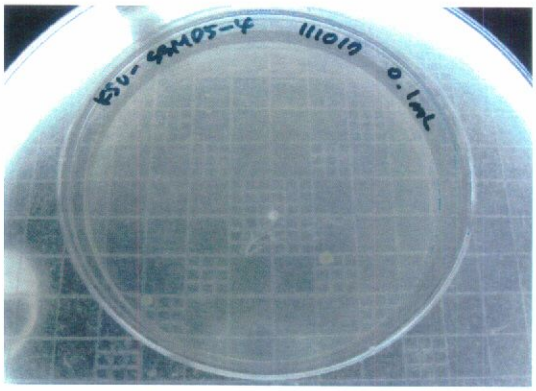
3. To be continued

· **de-Ballasting (4th test cycle: 2011. 10. 17)**



Heterotrophic bacteria

(Control water)



Heterotrophic bacteria

(Treated water)

Total coliform

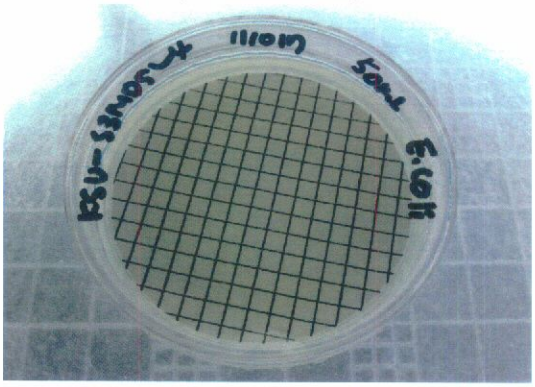
(Control water)

Total coliform

(Treated water)

Escherichia coli

(Control water)

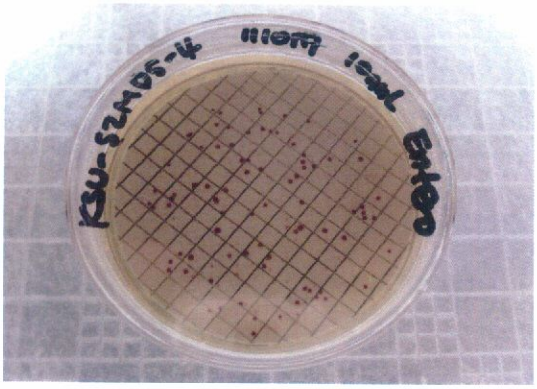


Escherichia coli

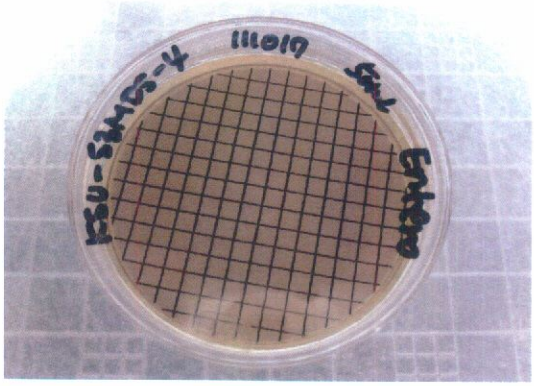
(Treated water)

3. To be continued

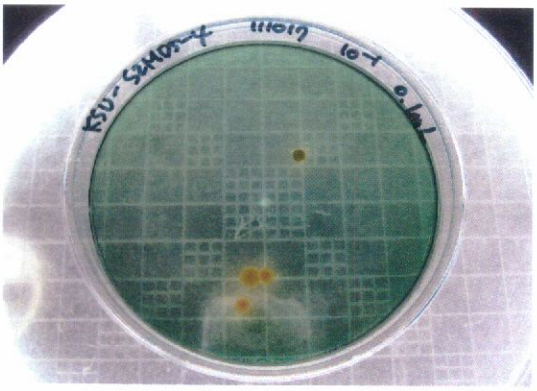
· de-Ballasting (4th test cycle: 2011. 10. 17)



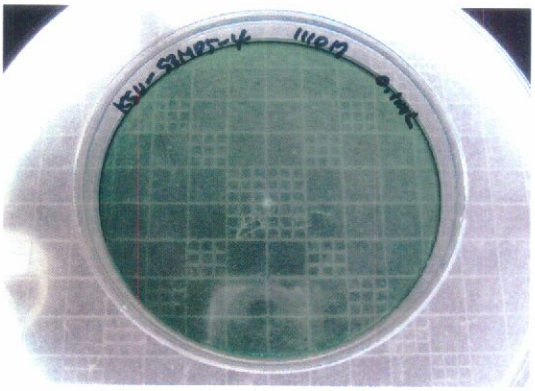
Intestinal Enterococci
(Control water)



Intestinal Enterococci
(Treated water)



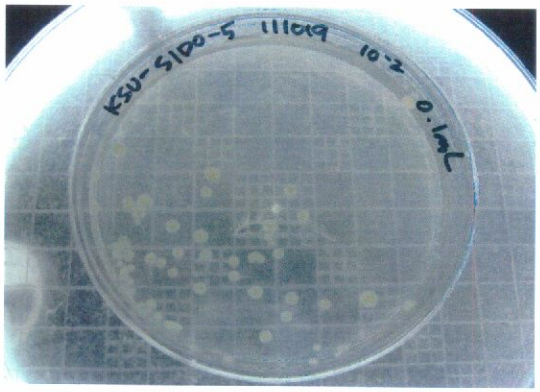
Toxicogenic *V. cholerae*
(Control water)



Toxicogenic *V. cholerae*
(Treated water)

3. To be continued

· **Ballasting (5th test cycle: 2011. 10. 19)**

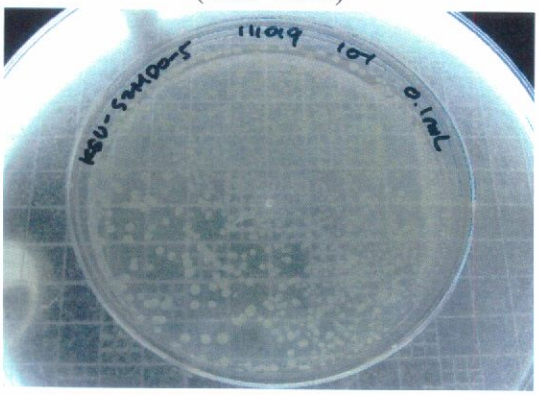


Heterotrophic bacteria

(Test water)

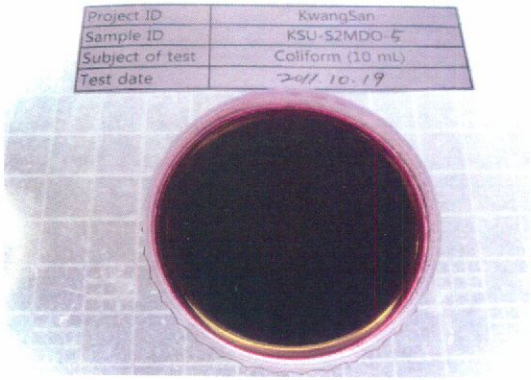
Total coliform

(Test water)



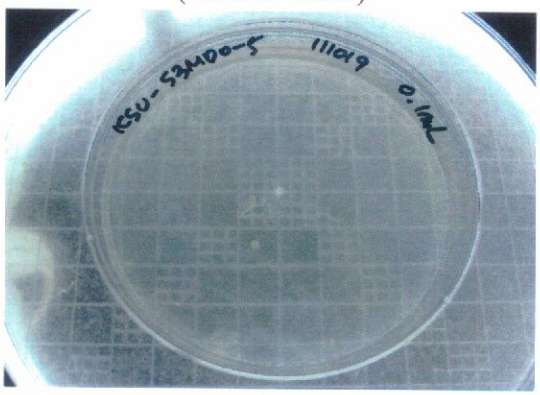
Heterotrophic bacteria

(Control water)



Total coliform

(Control water)



Heterotrophic bacteria

(Treated water)

Total coliform

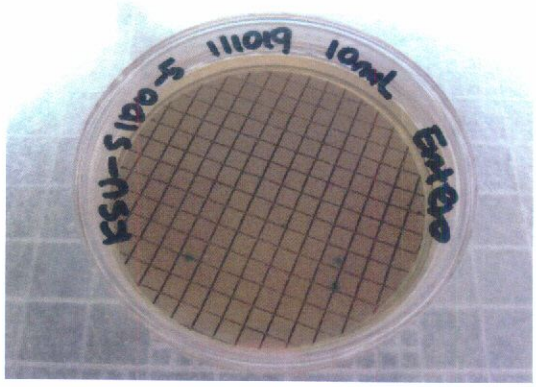
(Treated water)

3. To be continued

· **Ballasting (5th test cycle: 2011. 10. 19)**

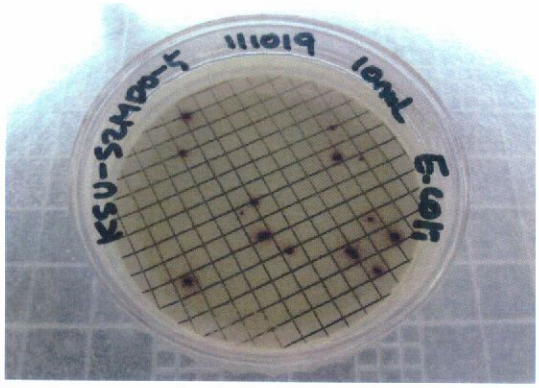
Escherichia coli

(Test water)



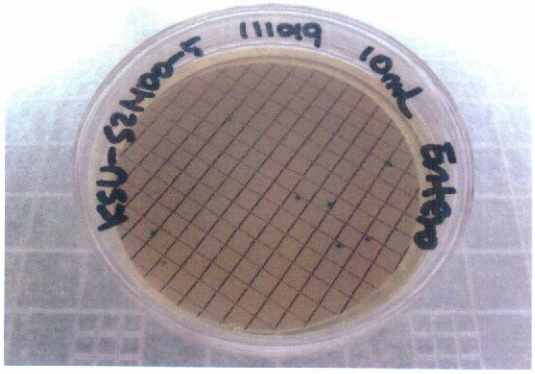
Intestinal Enterococci

(Test water)



Escherichia coli

(Control water)

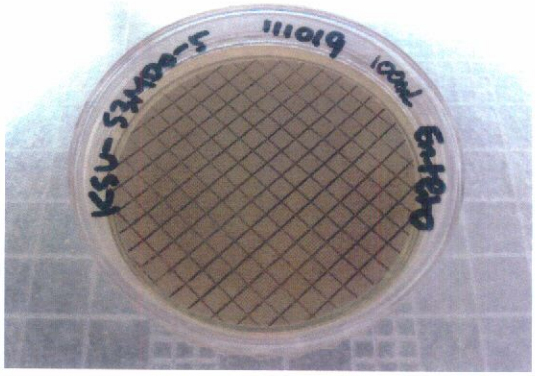


Intestinal Enterococci

(Control water)

Escherichia coli

(Treated water)

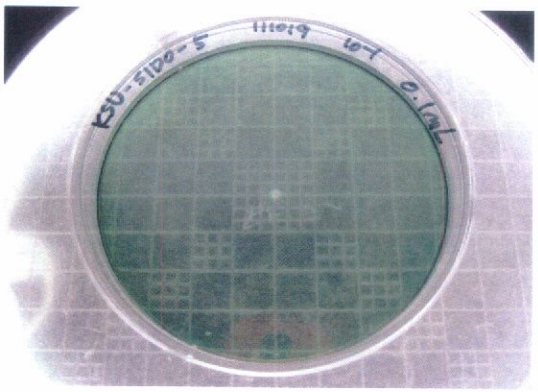


Intestinal Enterococci

(Treated water)

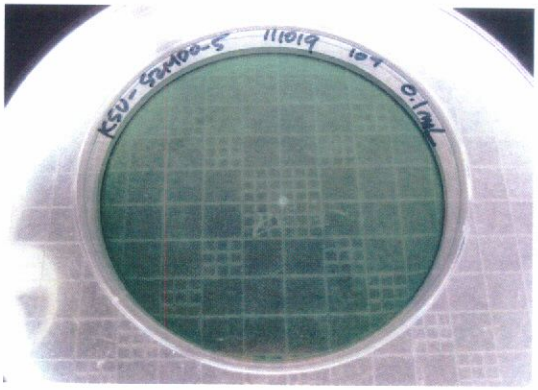
3. To be continued

· **Ballasting (5th test cycle: 2011. 10. 19)**



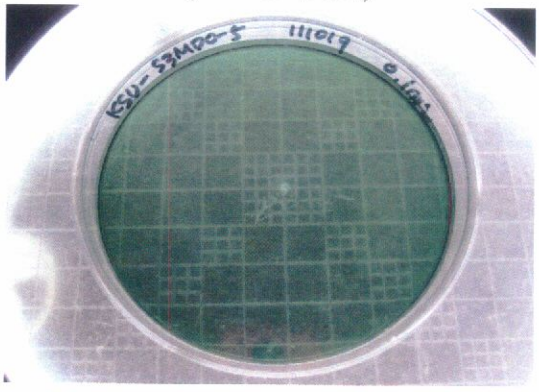
Toxicogenic *V. cholerae*

(Test water)



Toxicogenic *V. cholerae*

(Control water)

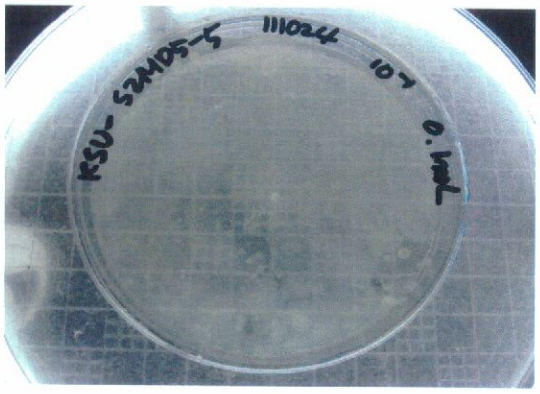


Toxicogenic *V. cholerae*

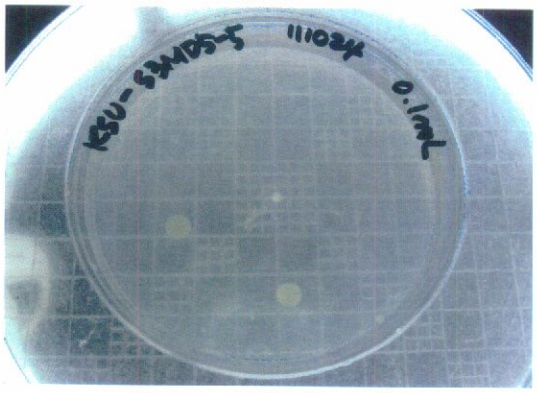
(Treated water)

3. To be continued

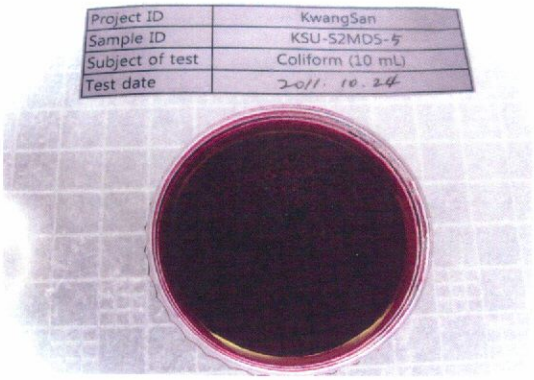
· **de-Ballasting (5th test cycle: 2011. 10. 24)**



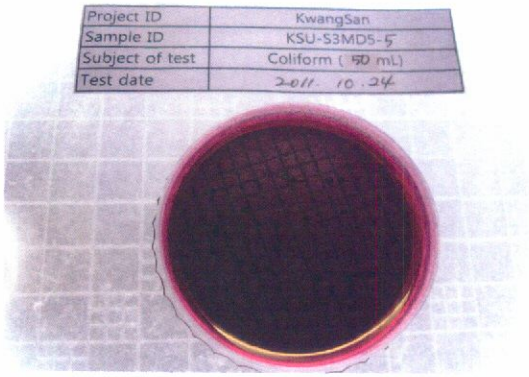
Heterotrophic bacteria
(Control water)



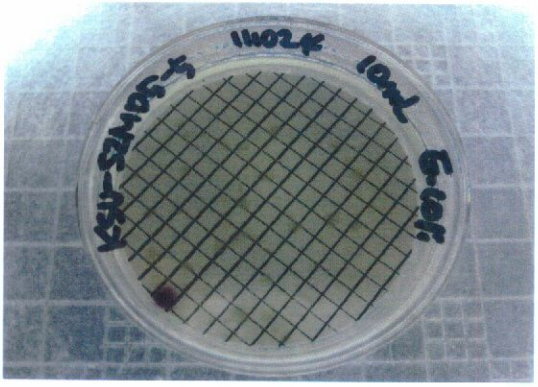
Heterotrophic bacteria
(Treated water)



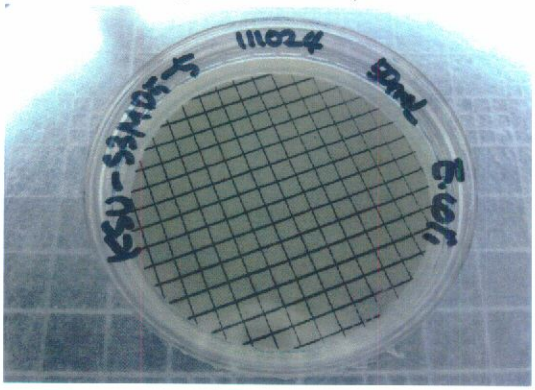
Total coliform
(Control water)



Total coliform
(Treated water)



Escherichia coli
(Control water)

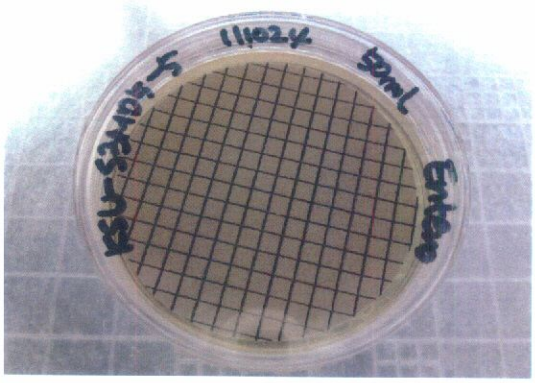


Escherichia coli
(Treated water)

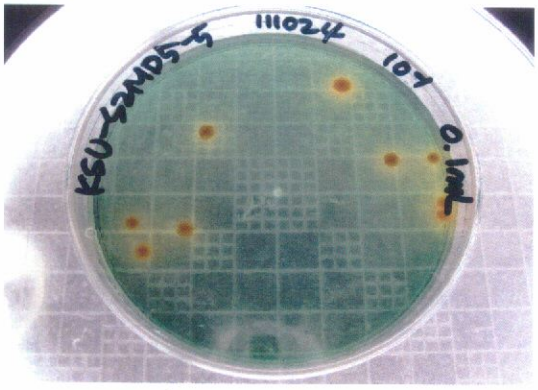
3. To be continued

· **de-Ballasting (5th test cycle: 2011. 10. 24)**

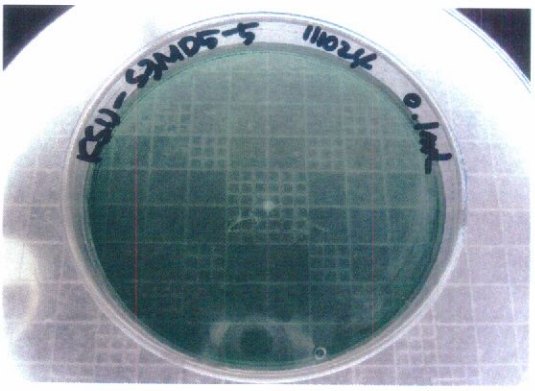
Intestinal Enterococci
(Control water)



Intestinal Enterococci
(Treated water)



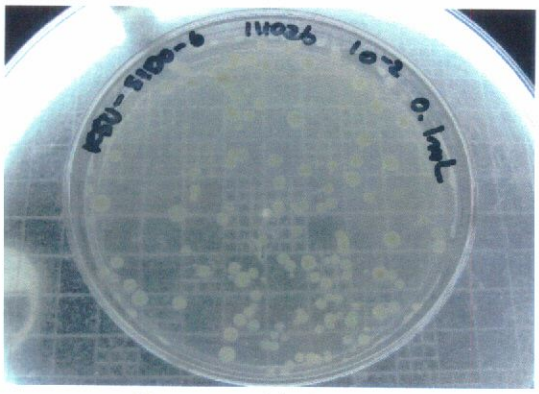
Toxicogenic *V. cholerae*
(Control water)



Toxicogenic *V. cholerae*
(Treated water)

3. To be continued

· **Ballasting (6th test cycle: 2011. 10. 26)**

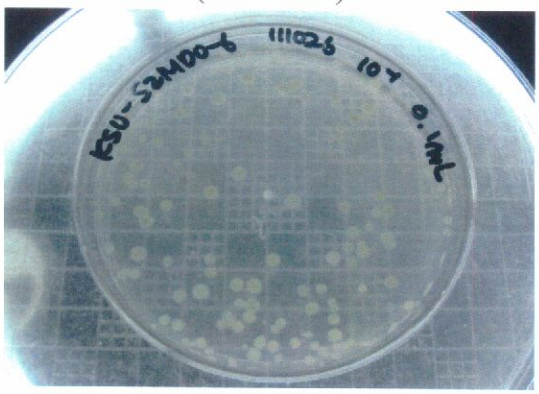


Heterotrophic bacteria

(Test water)

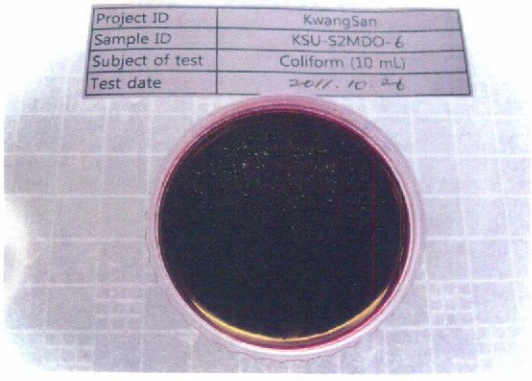
Total coliform

(Test water)



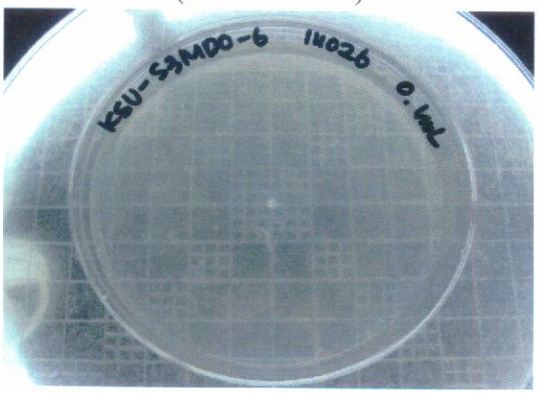
Heterotrophic bacteria

(Control water)



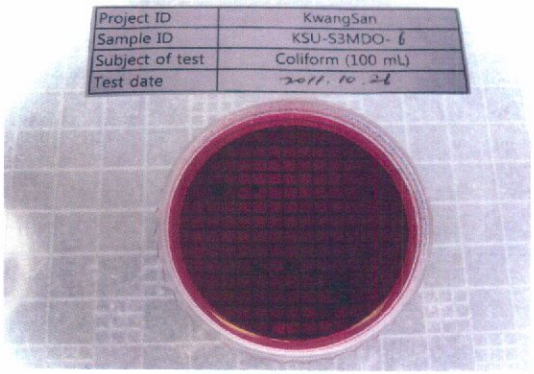
Total coliform

(Control water)



Heterotrophic bacteria

(Treated water)

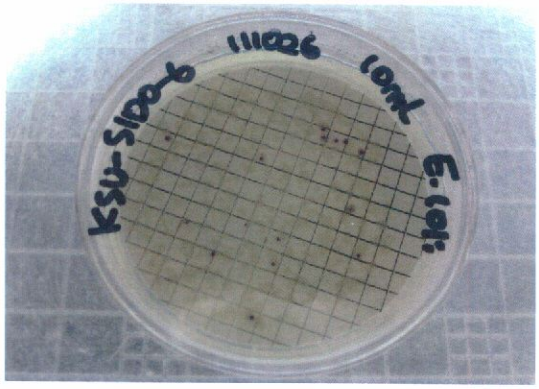


Total coliform

(Treated water)

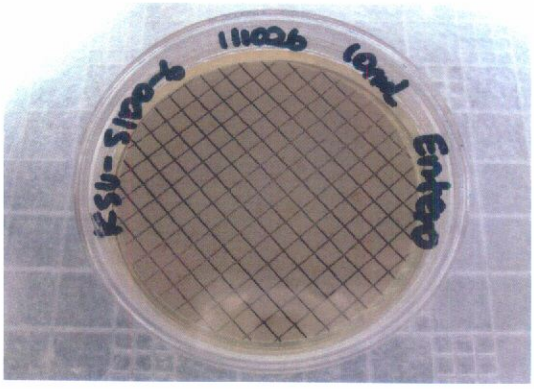
3. To be continued

· **Ballasting (6th test cycle: 2011. 10. 26)**



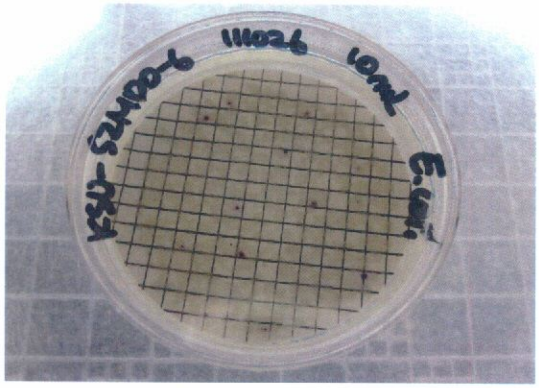
Escherichia coli

(Test water)



Intestinal Enterococci

(Test water)

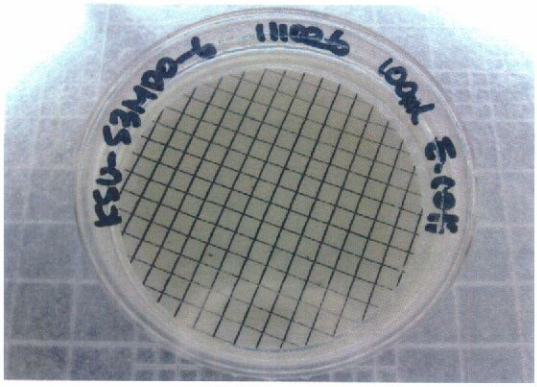


Escherichia coli

(Control water)

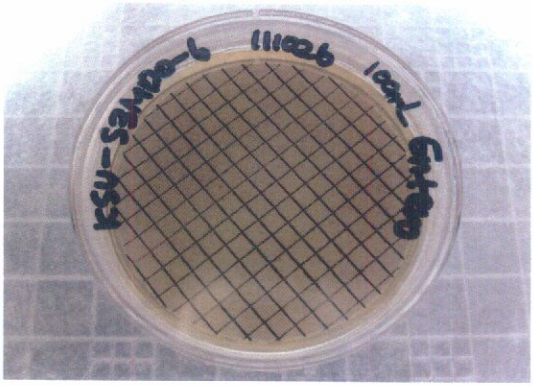
Intestinal Enterococci

(Control water)



Escherichia coli

(Treated water)

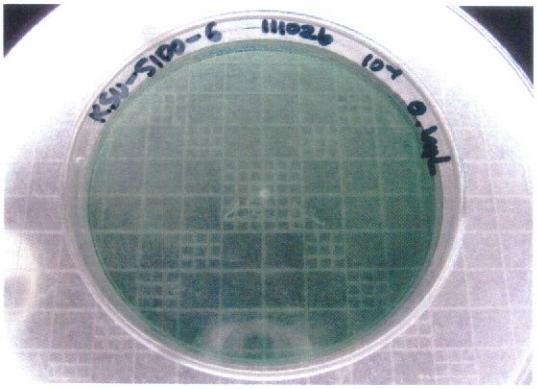


Intestinal Enterococci

(Treated water)

3. To be continued

· **Ballasting (6th test cycle: 2011. 10. 26)**

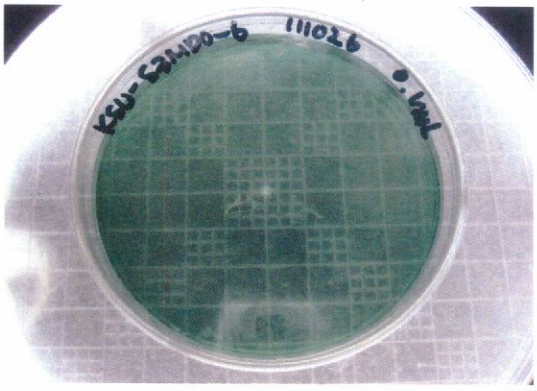


Toxicogenic *V. cholerae*

(Test water)

Toxicogenic *V. cholerae*

(Control water)

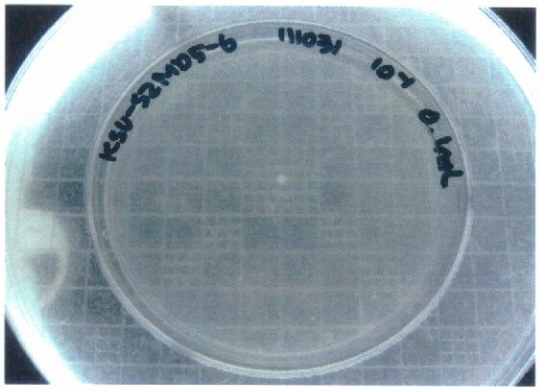


Toxicogenic *V. cholerae*

(Treated water)

3. To be continued

· **de-Ballasting (6th test cycle: 2011. 10. 31)**

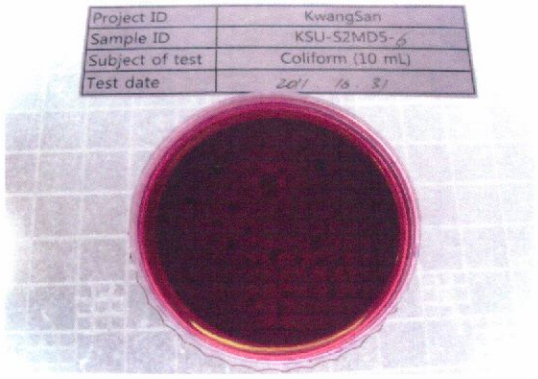


Heterotrophic bacteria

(Control water)

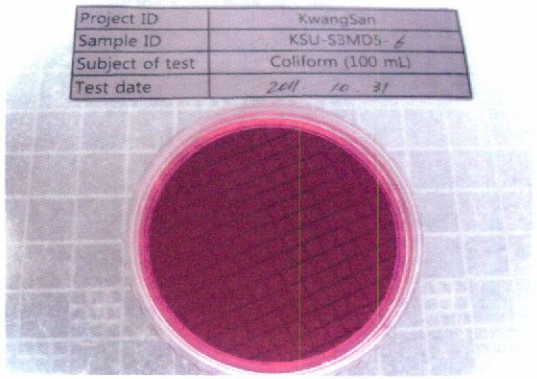
Heterotrophic bacteria

(Treated water)



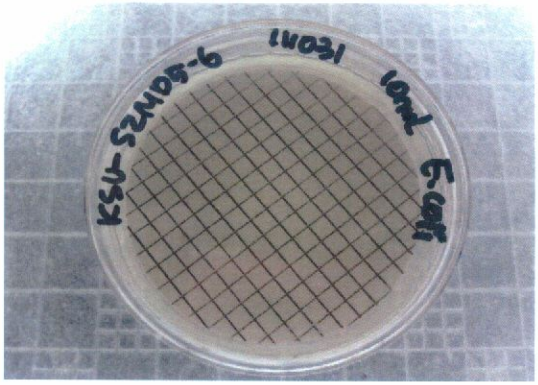
Total coliform

(Control water)



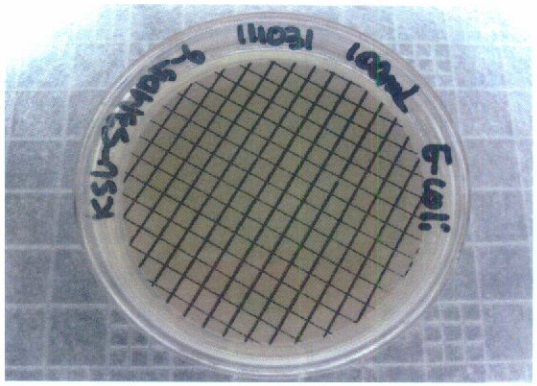
Total coliform

(Treated water)



Escherichia coli

(Control water)



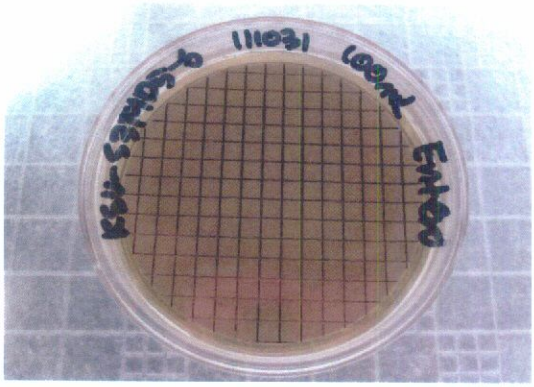
Escherichia coli

(Treated water)

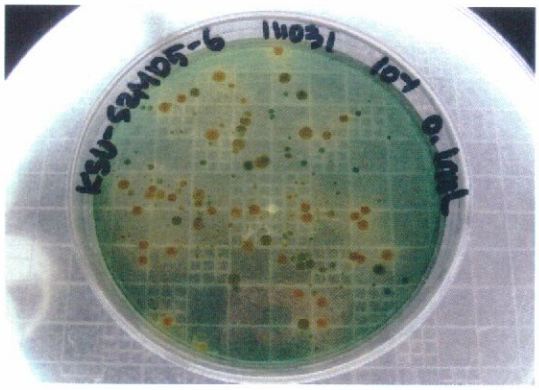
3. To be continued

· **de-Ballasting (6th test cycle: 2011. 10. 31)**

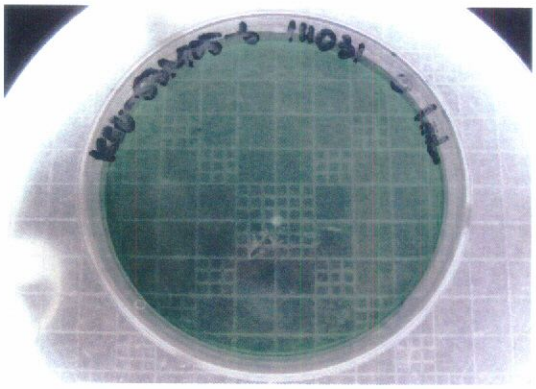
Intestinal Enterococci
(Control water)



Intestinal Enterococci
(Treated water)



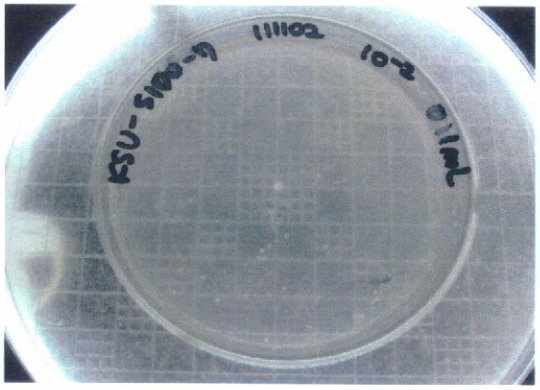
Toxicogenic *V. cholerae*
(Control water)



Toxicogenic *V. cholerae*
(Treated water)

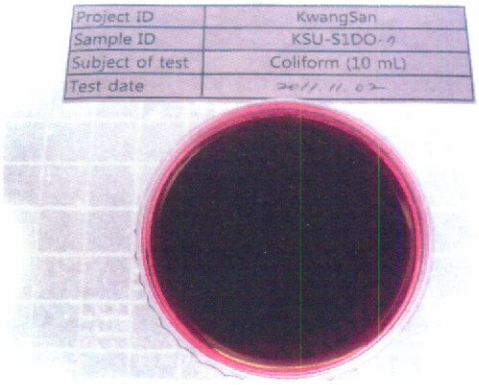
3. To be continued

· **Ballasting (7th test cycle: 2011. 11. 02)**



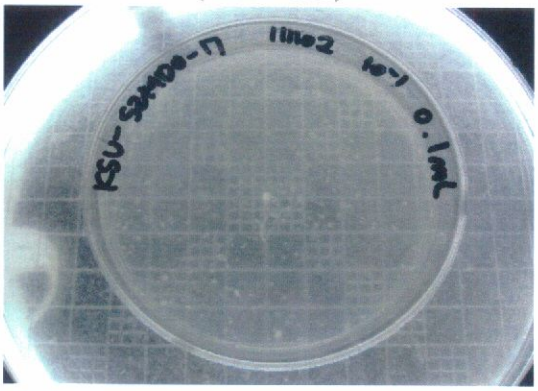
Heterotrophic bacteria

(Test water)



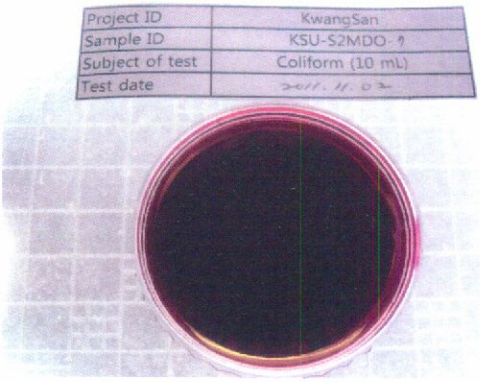
Total coliform

(Test water)



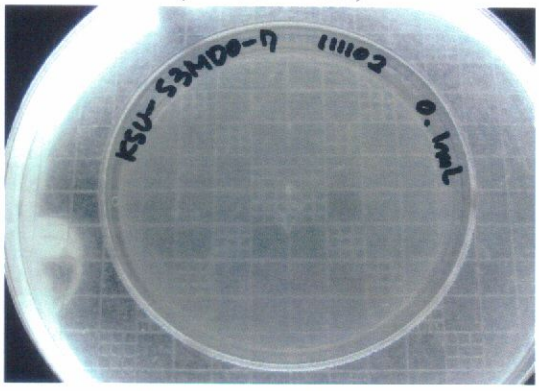
Heterotrophic bacteria

(Control water)



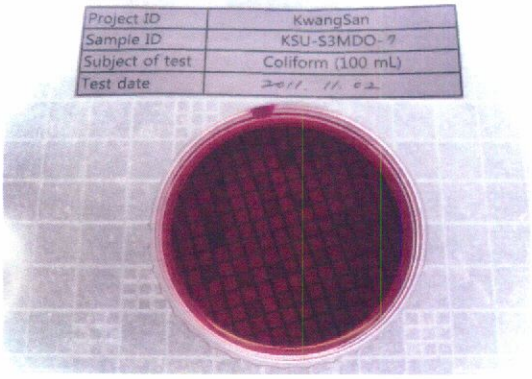
Total coliform

(Control water)



Heterotrophic bacteria

(Treated water)

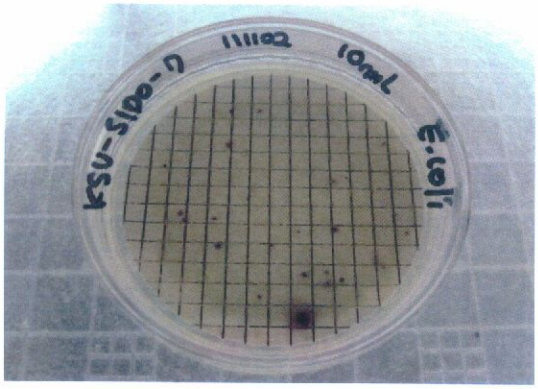


Total coliform

(Treated water)

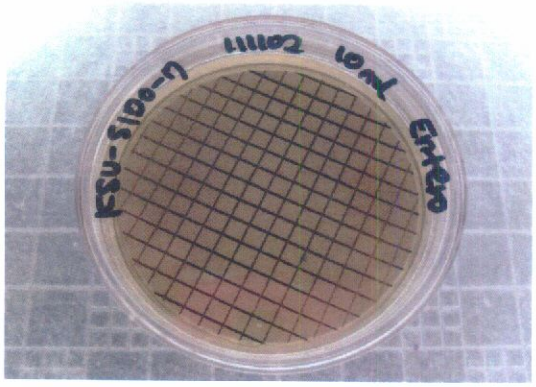
3. To be continued

· **Ballasting (7th test cycle: 2011. 11. 02)**



Escherichia coli

(Test water)

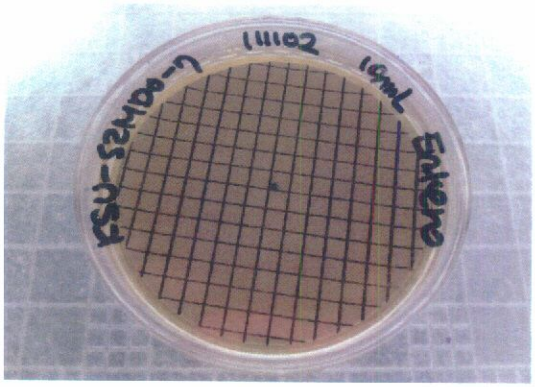


Intestinal Enterococci

(Test water)

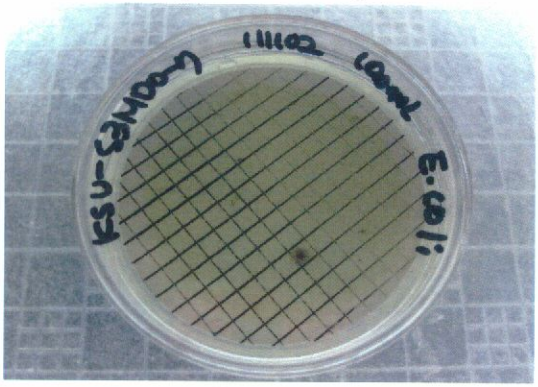
Escherichia coli

(Control water)



Intestinal Enterococci

(Control water)



Escherichia coli

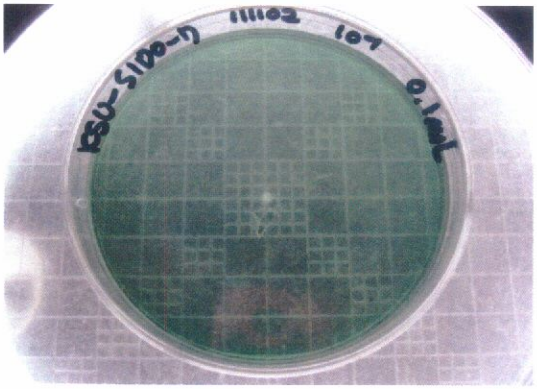
(Treated water)

Intestinal Enterococci

(Treated water)

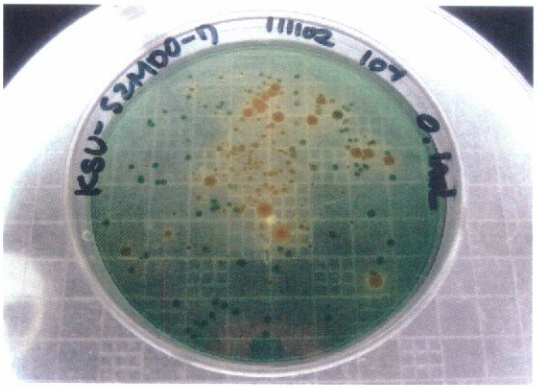
3. To be continued

· **Ballasting (7th test cycle: 2011. 11. 02)**



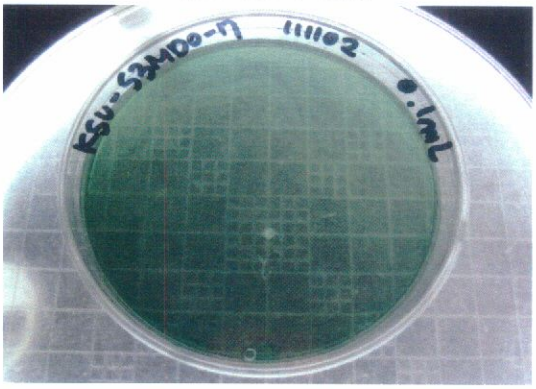
Toxicogenic *V. cholerae*

(Test water)



Toxicogenic *V. cholerae*

(Control water)

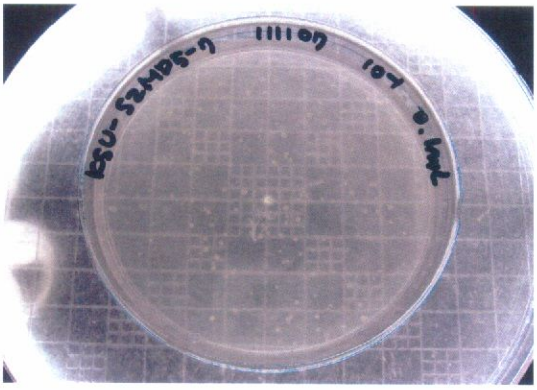


Toxicogenic *V. cholerae*

(Treated water)

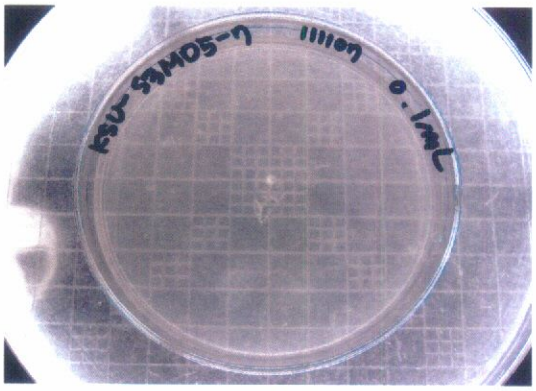
3. To be continued

· **de-Ballasting (7th test cycle: 2011. 11. 07)**



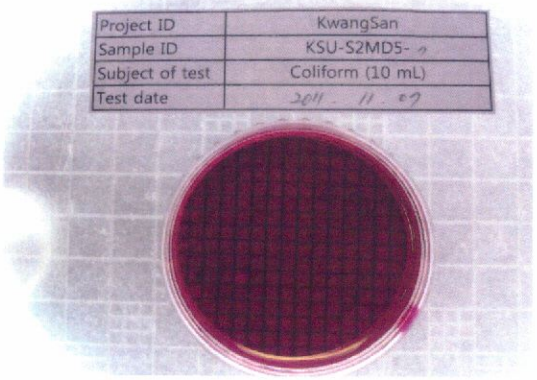
Heterotrophic bacteria

(Control water)



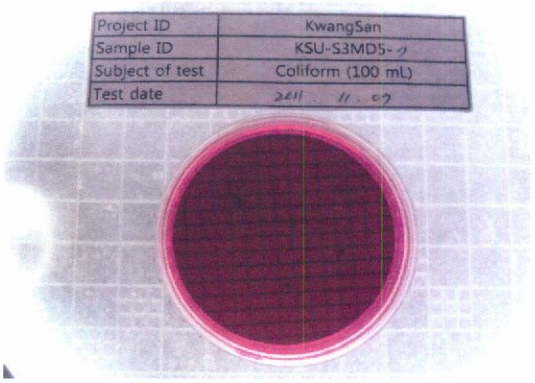
Heterotrophic bacteria

(Treated water)



Total coliform

(Control water)

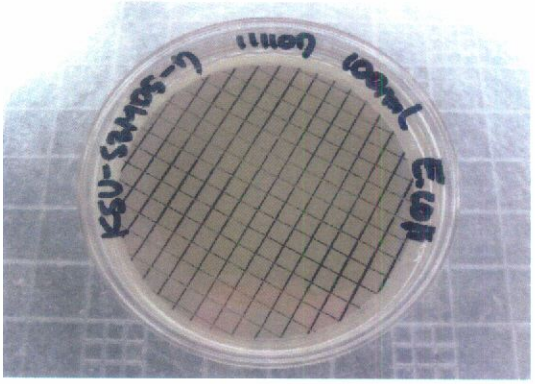


Total coliform

(Treated water)

Escherichia coli

(Control water)



Escherichia coli

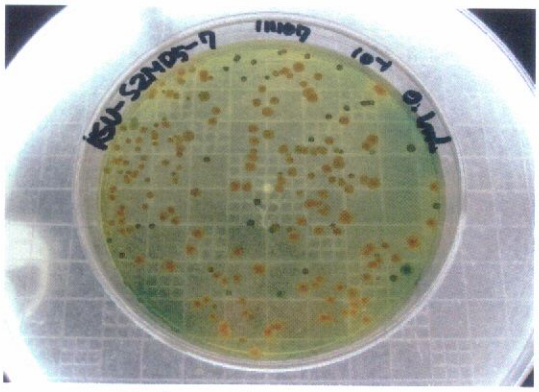
(Treated water)

3. To be continued

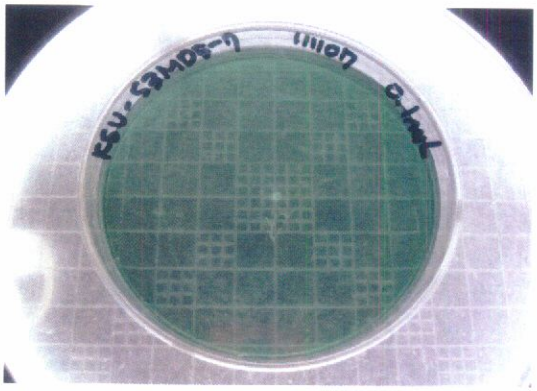
· **de-Ballasting (7th test cycle: 2011. 11. 07)**

Intestinal Enterococci
(Control water)

Intestinal Enterococci
(Treated water)



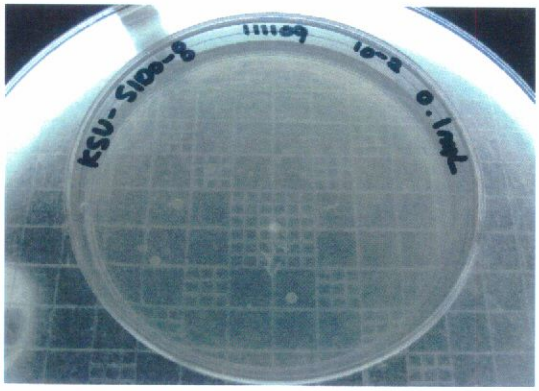
Toxicogenic *V. cholerae*
(Control water)



Toxicogenic *V. cholerae*
(Treated water)

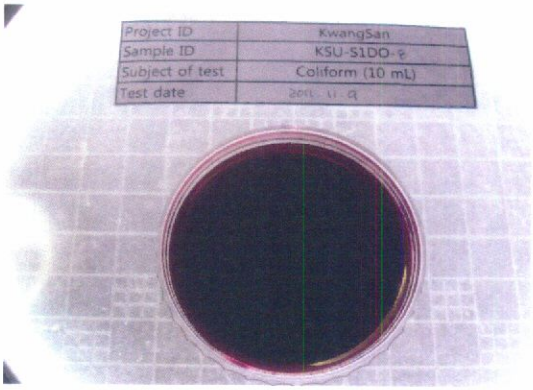
3. To be continued

· **Ballasting (8th test cycle: 2011. 11. 09)**



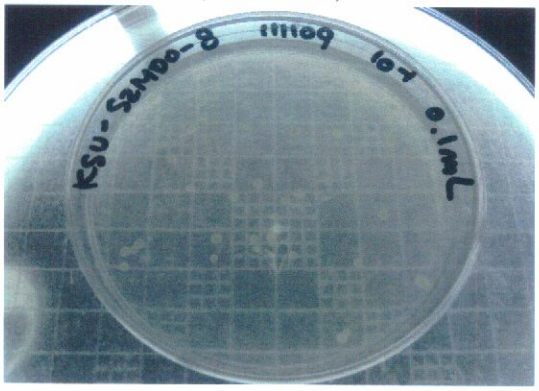
Heterotrophic bacteria

(Test water)



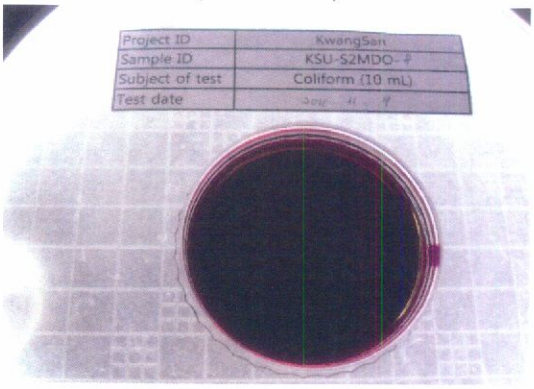
Total coliform

(Test water)



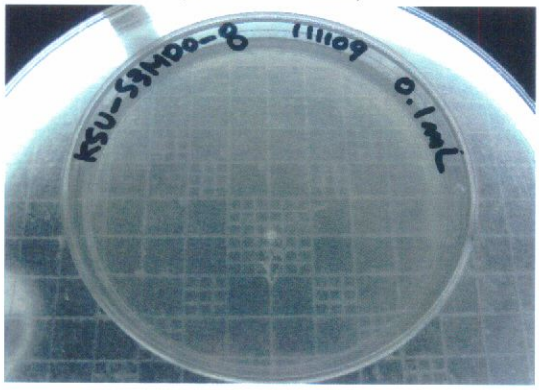
Heterotrophic bacteria

(Control water)



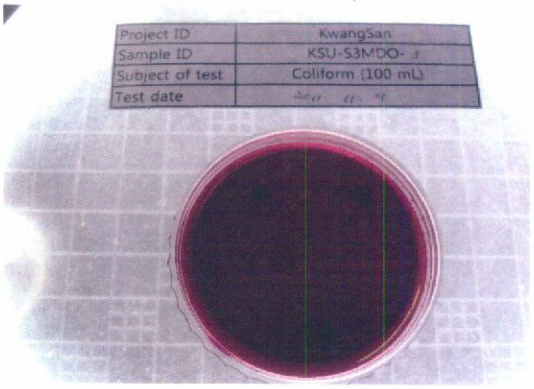
Total coliform

(Control water)



Heterotrophic bacteria

(Treated water)

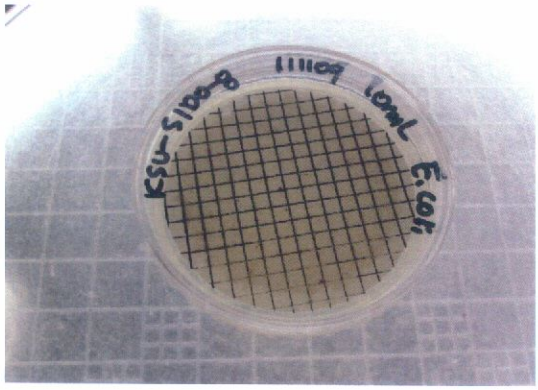


Total coliform

(Treated water)

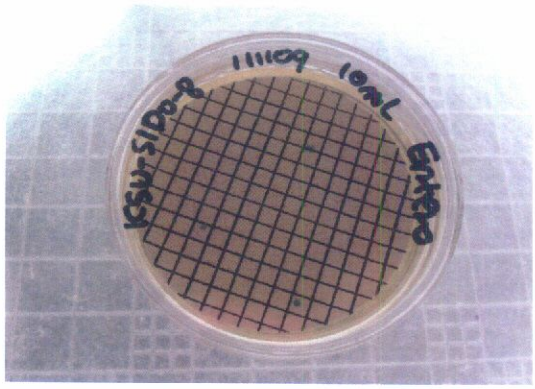
3. To be continued

· Ballasting (8th test cycle: 2011. 11. 09)



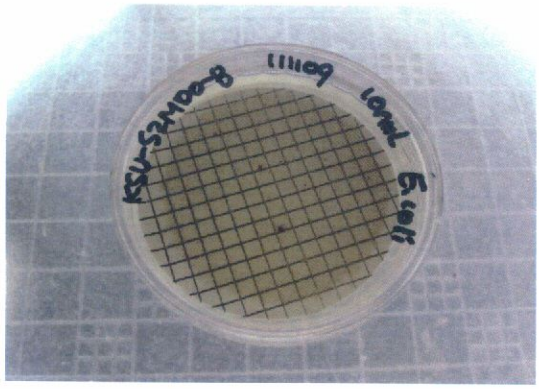
Escherichia coli

(Test water)



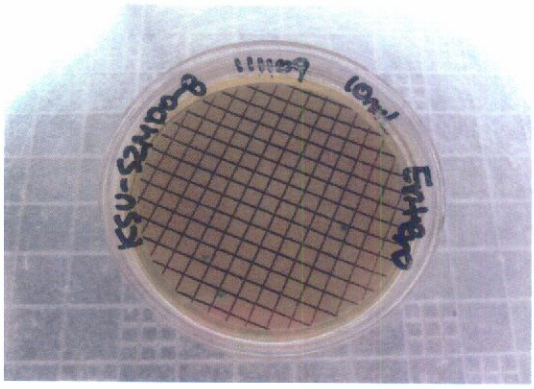
Intestinal Enterococci

(Test water)



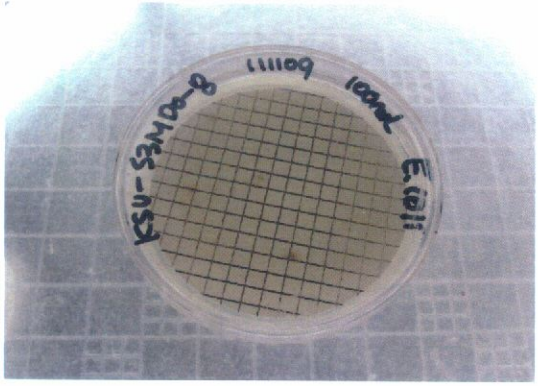
Escherichia coli

(Control water)



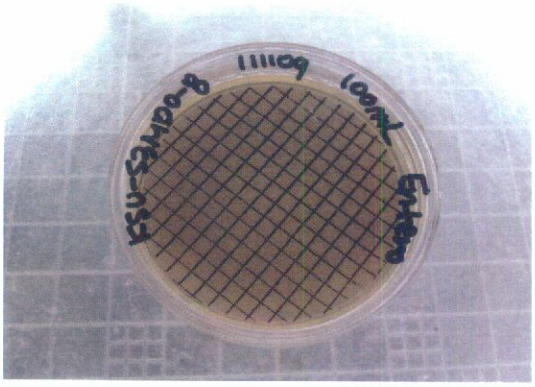
Intestinal Enterococci

(Control water)



Escherichia coli

(Treated water)

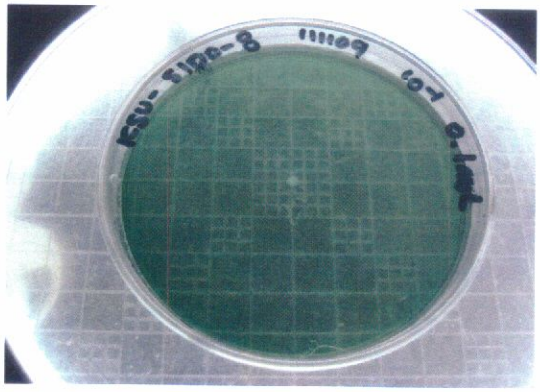


Intestinal Enterococci

(Treated water)

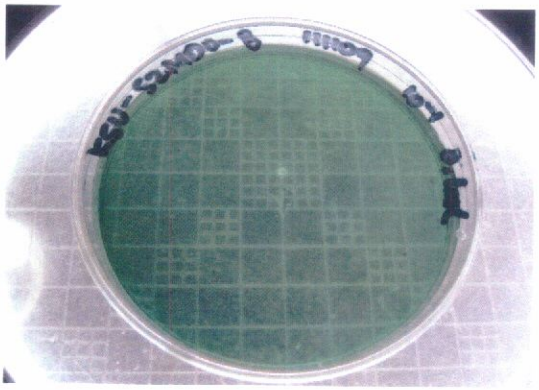
3. To be continued

· **Ballasting (8th test cycle: 2011. 11. 09)**



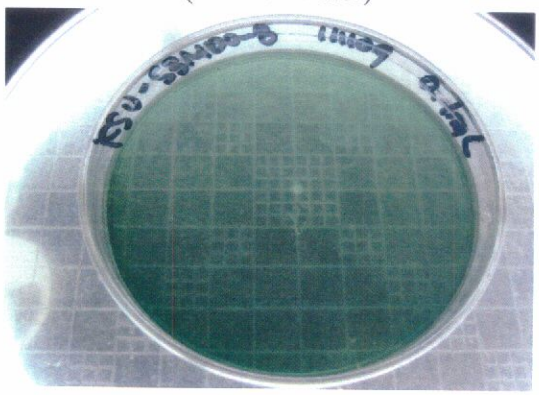
Toxicogenic *V. cholerae*

(Test water)



Toxicogenic *V. cholerae*

(Control water)

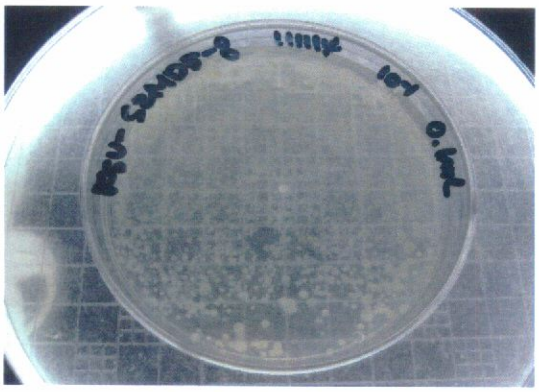


Toxicogenic *V. cholerae*

(Treated water)

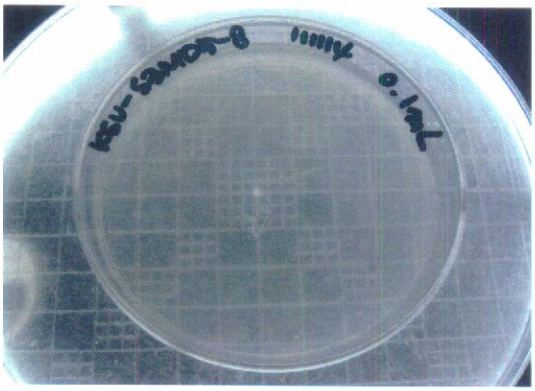
3. To be continued

· **de-Ballasting (8th test cycle: 2011. 11. 14)**



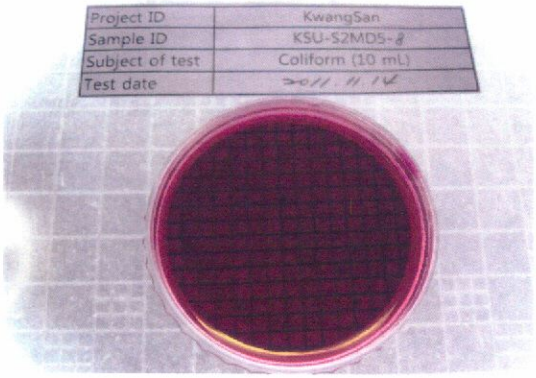
Heterotrophic bacteria

(Control water)



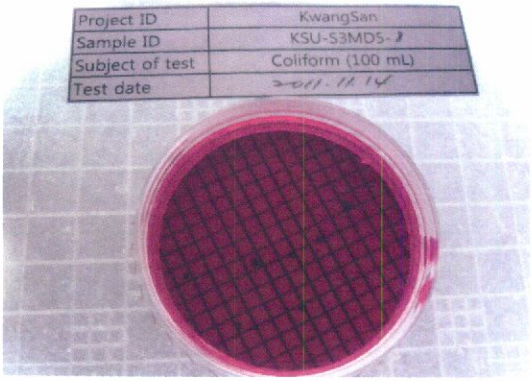
Heterotrophic bacteria

(Treated water)



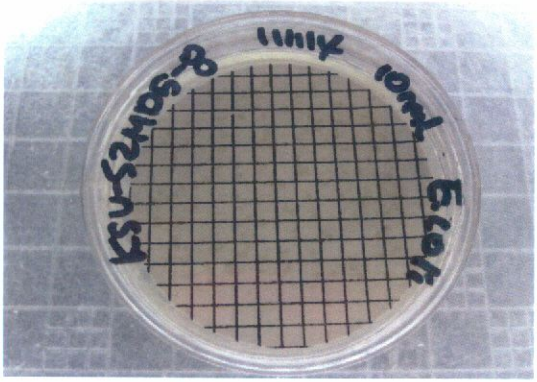
Total coliform

(Control water)



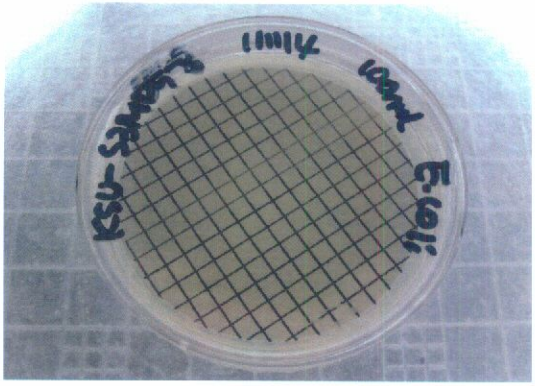
Total coliform

(Treated water)



Escherichia coli

(Control water)

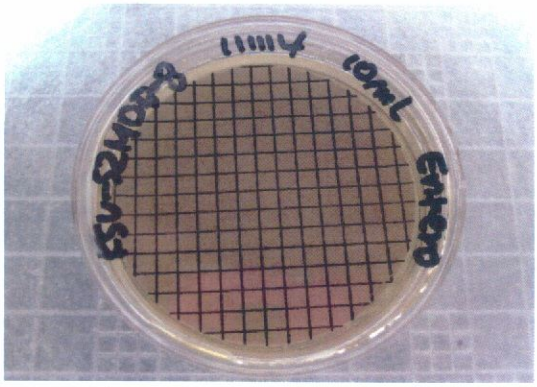


Escherichia coli

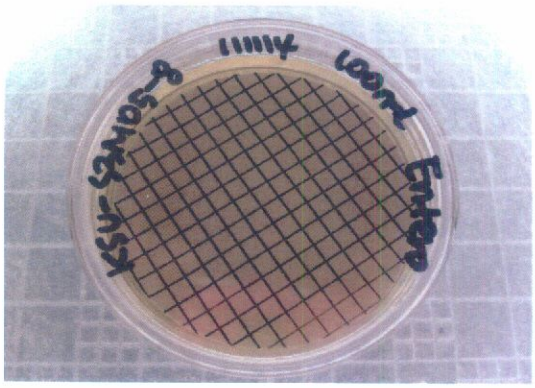
(Treated water)

3. To be continued

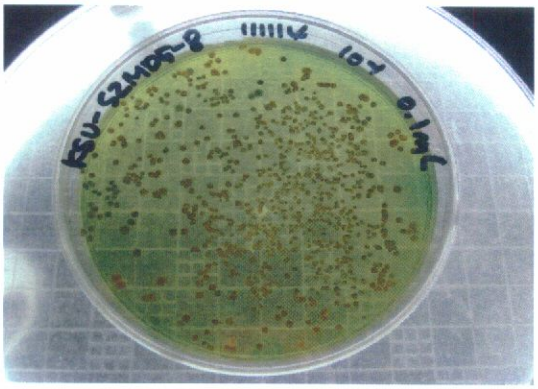
· **de-Ballasting (8th test cycle: 2011. 11. 14)**



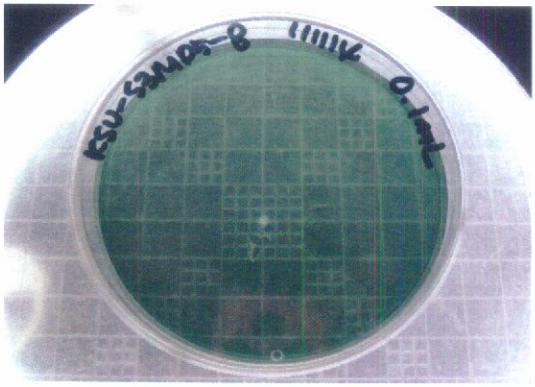
Intestinal Enterococci
(Control water)



Intestinal Enterococci
(Treated water)



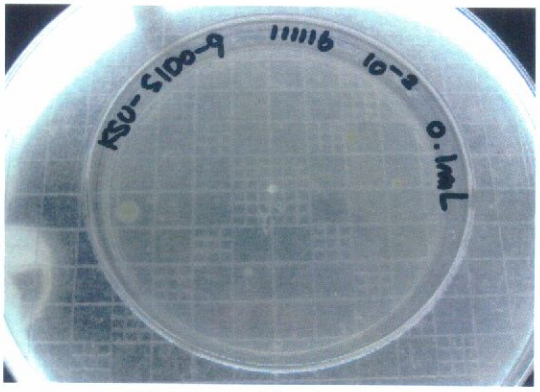
Toxicogenic *V. cholerae*
(Control water)



Toxicogenic *V. cholerae*
(Treated water)

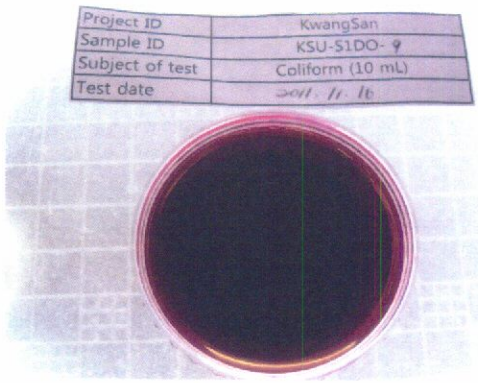
3. To be continued

· **Ballasting (9th test cycle: 2011. 11. 16)**



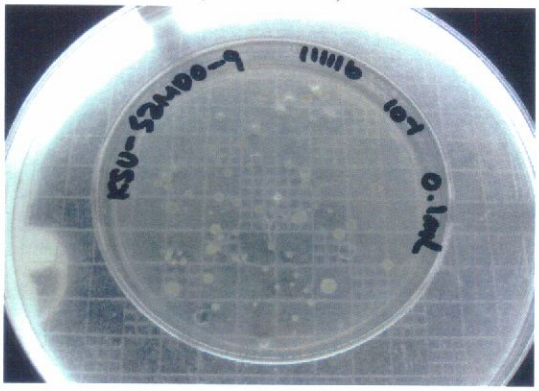
Heterotrophic bacteria

(Test water)



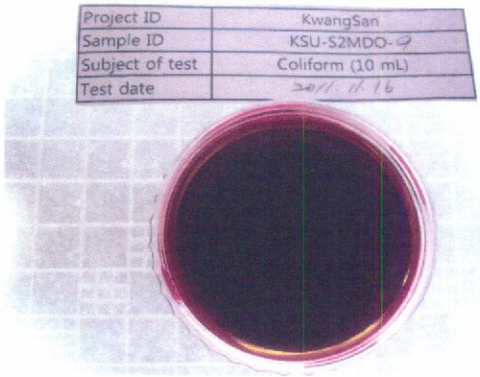
Total coliform

(Test water)



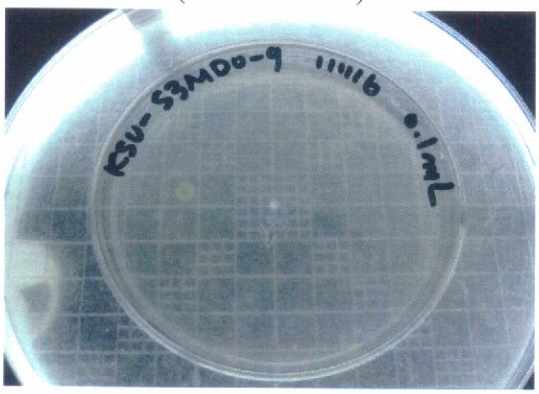
Heterotrophic bacteria

(Control water)



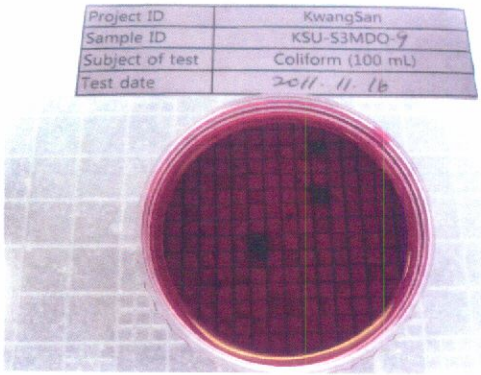
Total coliform

(Control water)



Heterotrophic bacteria

(Treated water)



Total coliform

(Treated water)

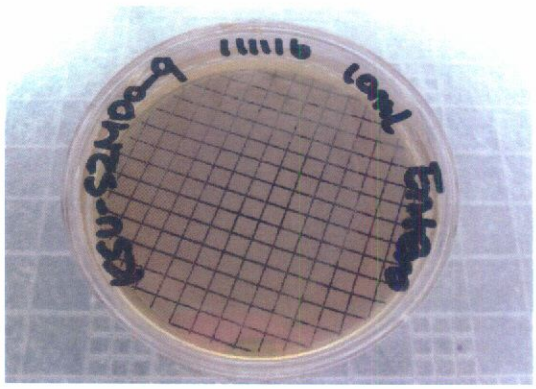
3. To be continued

· **Ballasting (9th test cycle: 2011. 11. 16)**

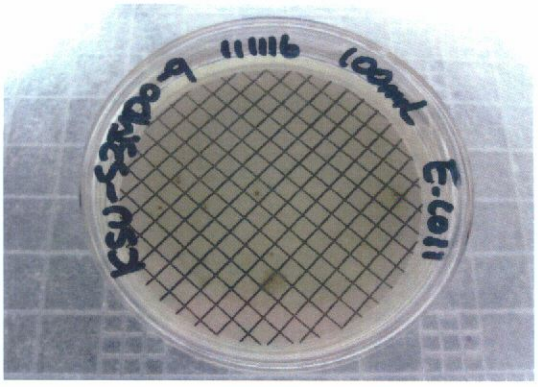
Escherichia coli
(Test water)

Intestinal Enterococci
(Test water)

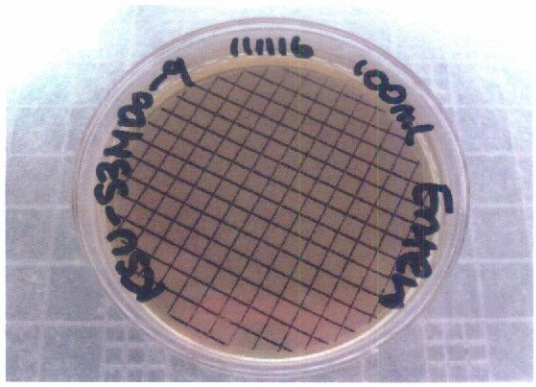
Escherichia coli
(Control water)



Intestinal Enterococci
(Control water)



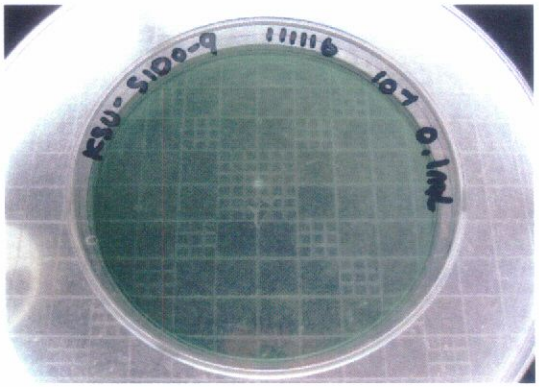
Escherichia coli
(Treated water)



Intestinal Enterococci
(Treated water)

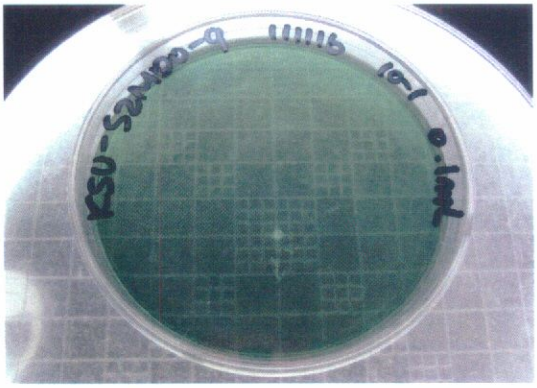
3. To be continued

· **Ballasting (9th test cycle: 2011. 11. 16)**



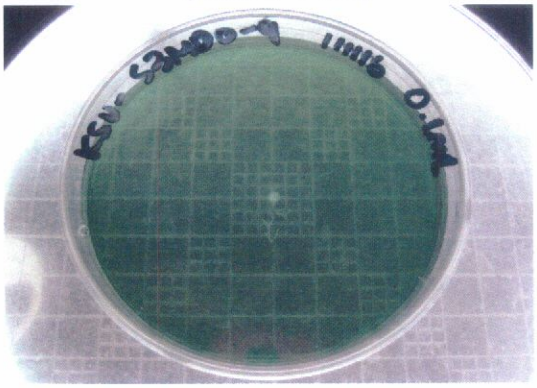
Toxicogenic *V. cholerae*

(Test water)



Toxicogenic *V. cholerae*

(Control water)

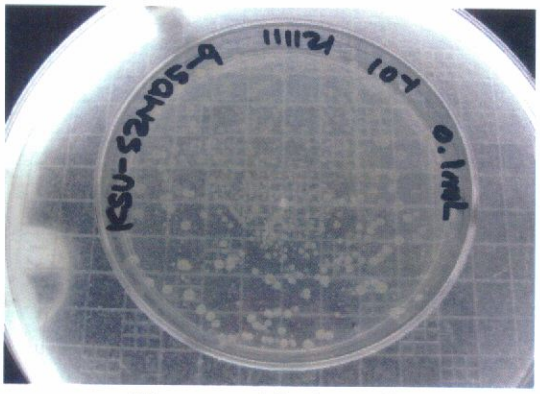


Toxicogenic *V. cholerae*

(Treated water)

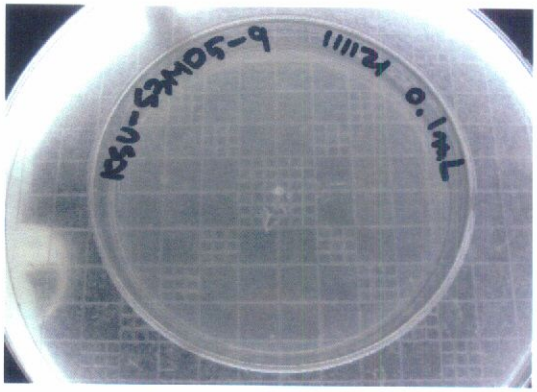
3. To be continued

· **de-Ballasting (9th test cycle: 2011. 11. 21)**



Heterotrophic bacteria

(Control water)

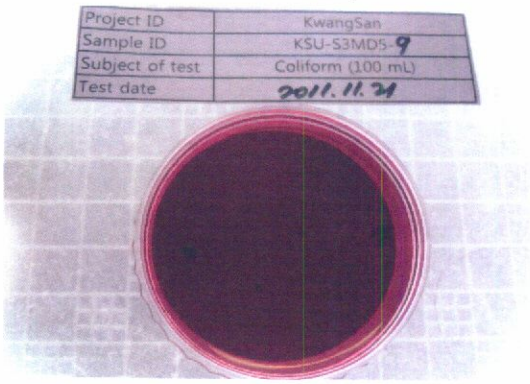


Heterotrophic bacteria

(Treated water)

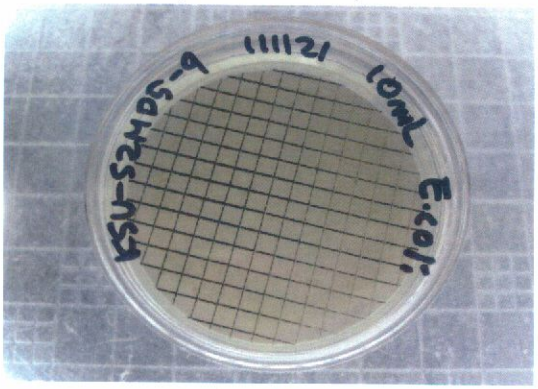
Total coliform

(Control water)



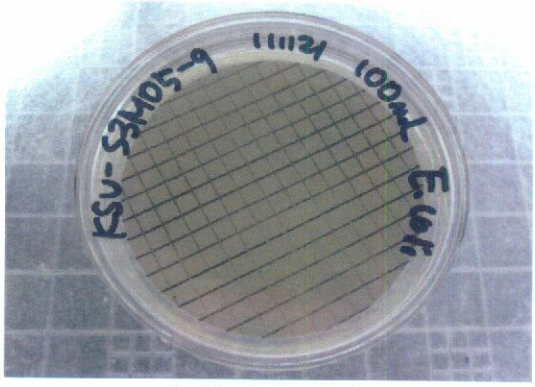
Total coliform

(Treated water)



Escherichia coli

(Control water)

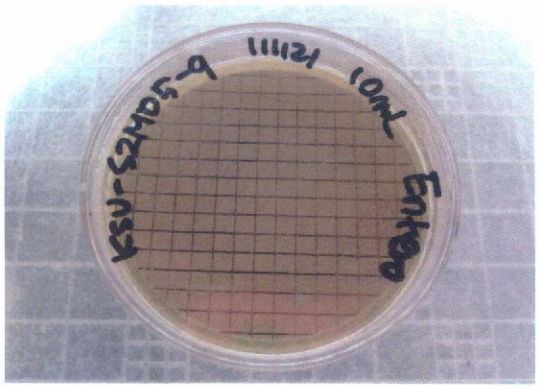


Escherichia coli

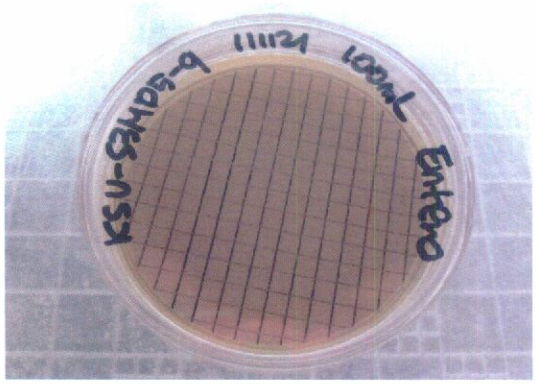
(Treated water)

3. To be continued

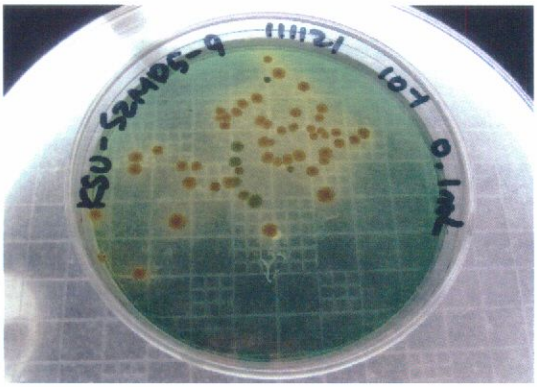
· **de-Ballasting (9th test cycle: 2011. 11. 21)**



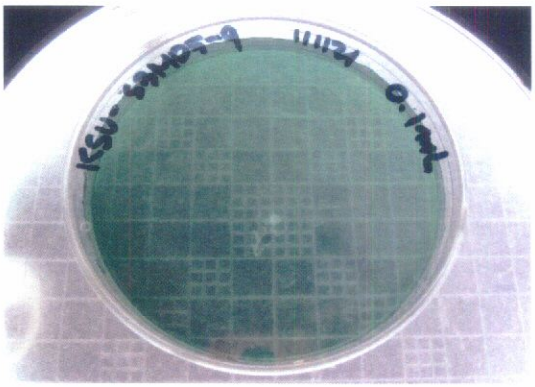
Intestinal Enterococci
(Control water)



Intestinal Enterococci
(Treated water)



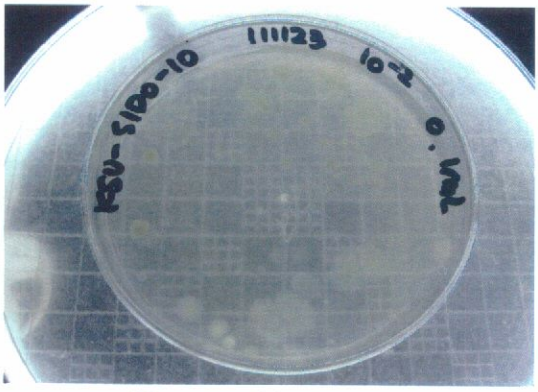
Toxicogenic *V. cholerae*
(Control water)



Toxicogenic *V. cholerae*
(Treated water)

3. To be continued

· **Ballasting (10th test cycle: 2011. 11. 23)**

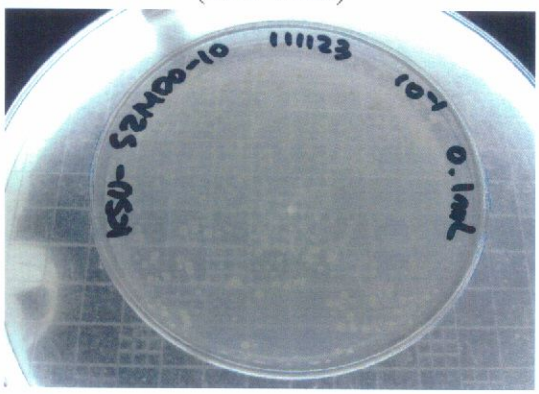


Heterotrophic bacteria

(Test water)

Total coliform

(Test water)

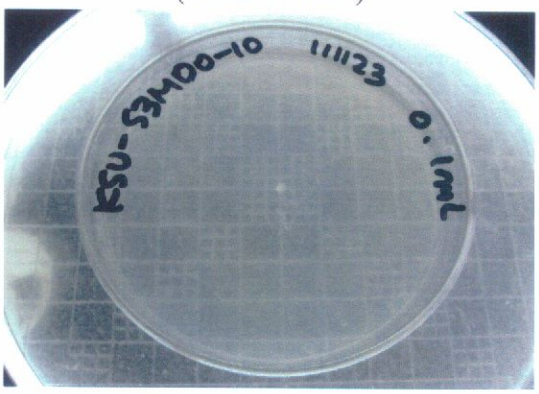


Heterotrophic bacteria

(Control water)

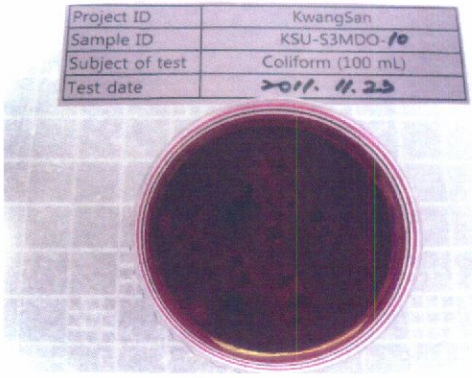
Total coliform

(Control water)



Heterotrophic bacteria

(Treated water)

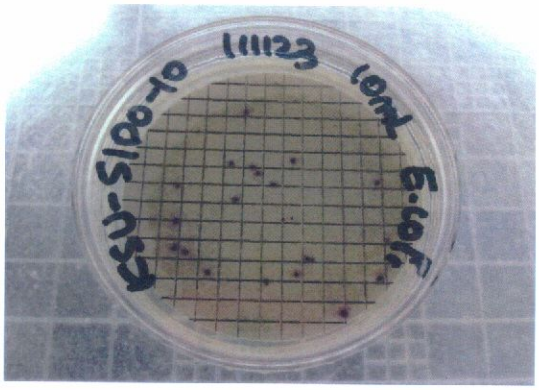


Total coliform

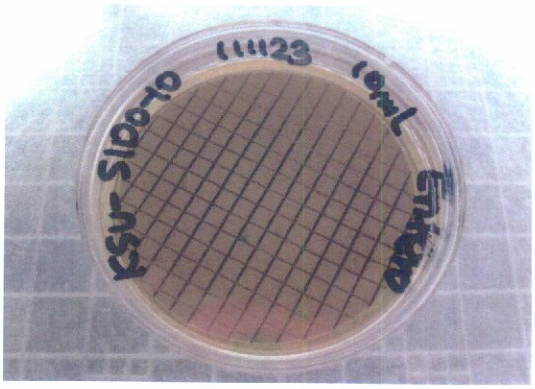
(Treated water)

3. To be continued

· **Ballasting (10th test cycle: 2011. 11. 23)**

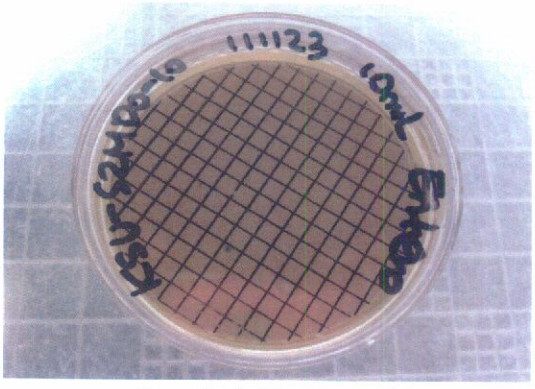


Escherichia coli
(Test water)

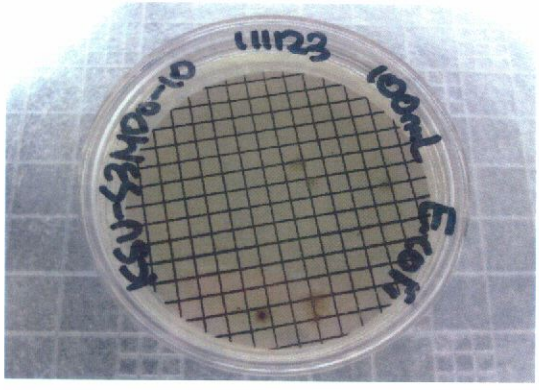


Intestinal Enterococci
(Test water)

Escherichia coli
(Control water)



Intestinal Enterococci
(Control water)

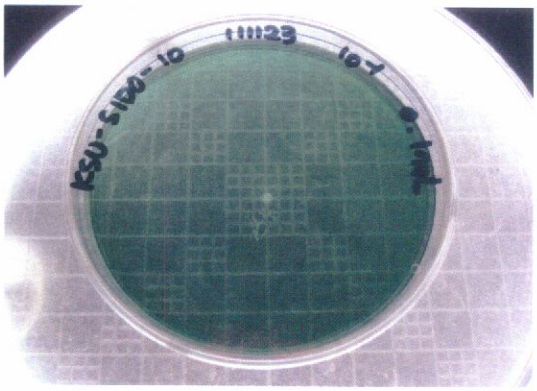


Escherichia coli
(Treated water)

Intestinal Enterococci
(Treated water)

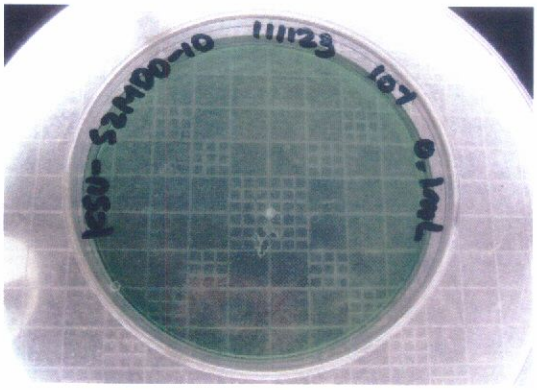
3. To be continued

· **Ballasting (10th test cycle: 2011. 11. 23)**



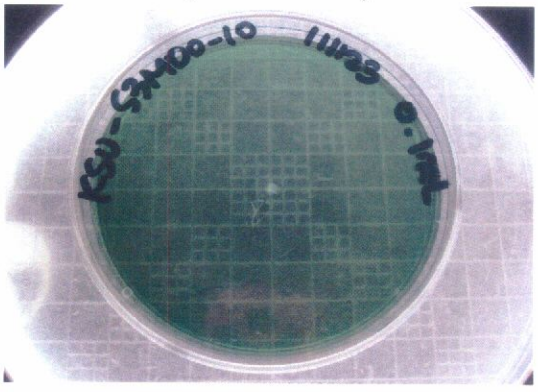
Toxicogenic *V. cholerae*

(Test water)



Toxicogenic *V. cholerae*

(Control water)

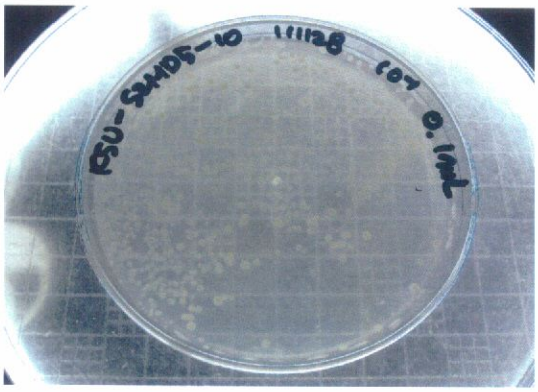


Toxicogenic *V. cholerae*

(Treated water)

3. To be continued

· **de-Ballasting (10th test cycle: 2011. 11. 28)**

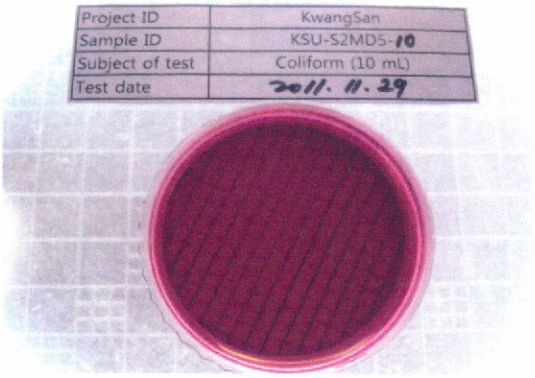


Heterotrophic bacteria

(Control water)

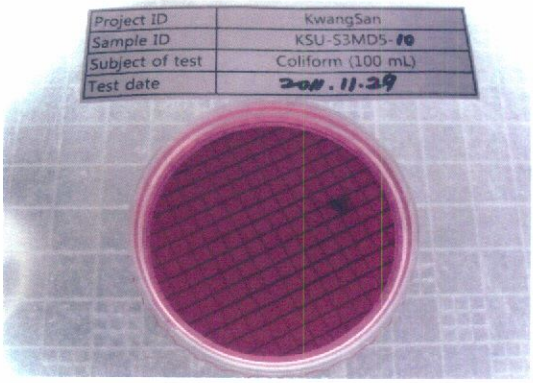
Heterotrophic bacteria

(Treated water)



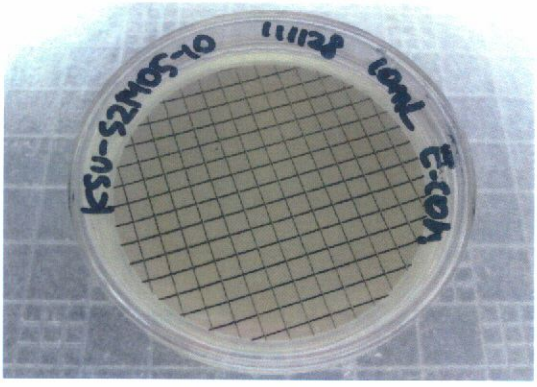
Total coliform

(Control water)



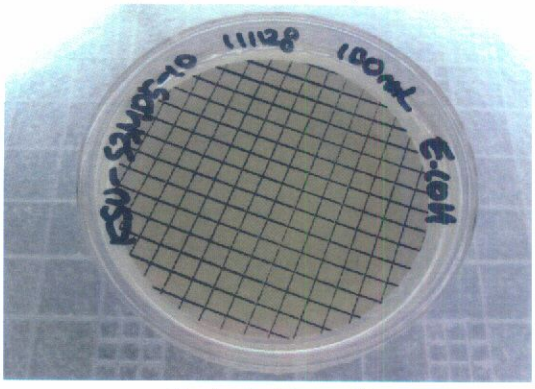
Total coliform

(Treated water)



Escherichia coli

(Control water)

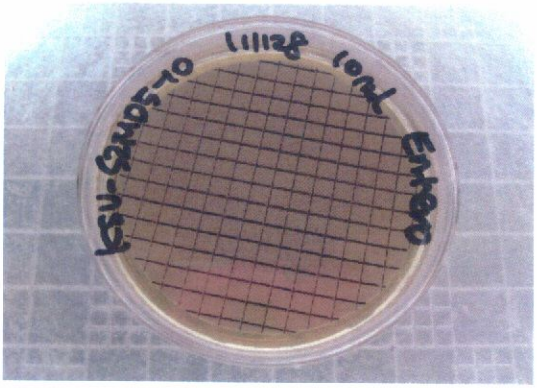


Escherichia coli

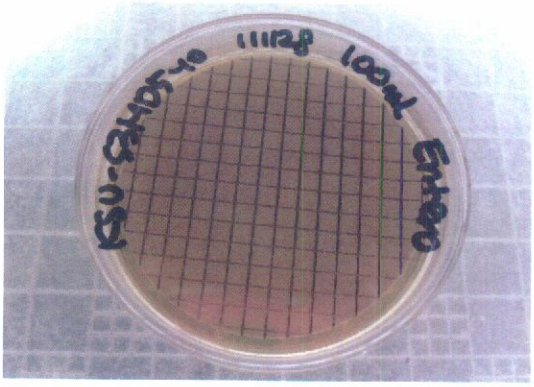
(Treated water)

3. To be continued

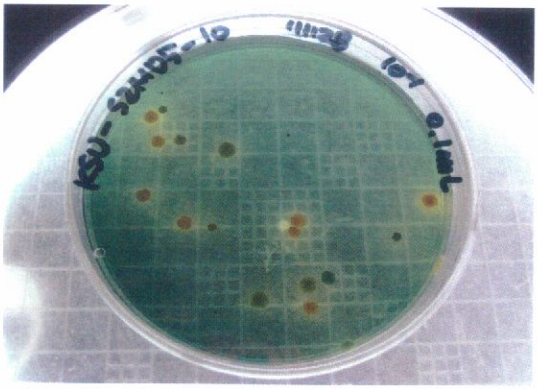
· **de-Ballasting (10th test cycle: 2011. 11. 28)**



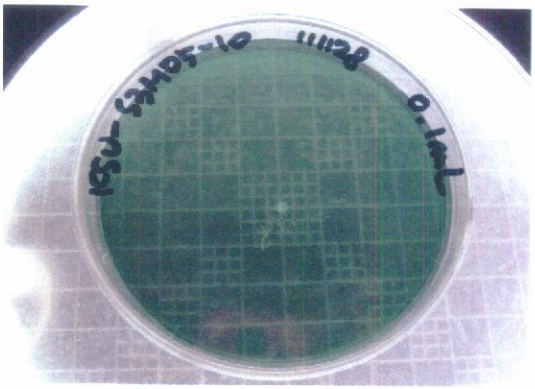
Intestinal Enterococci
(Control water)



Intestinal Enterococci
(Treated water)



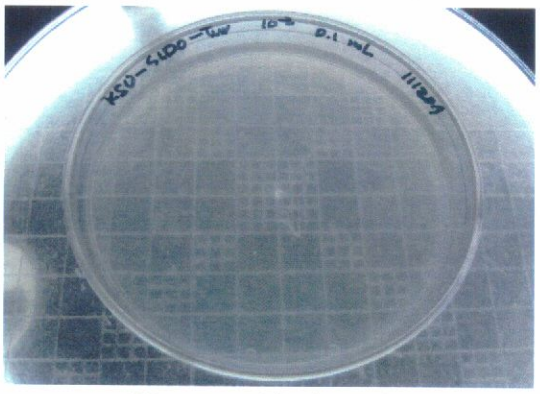
Toxicogenic *V. cholerae*
(Control water)



Toxicogenic *V. cholerae*
(Treated water)

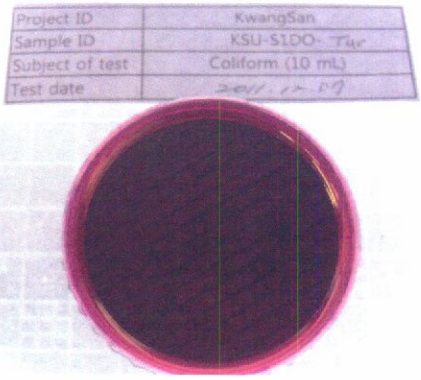
3. To be continued

· **Ballasting (11th test cycle: 2011. 12. 07)**



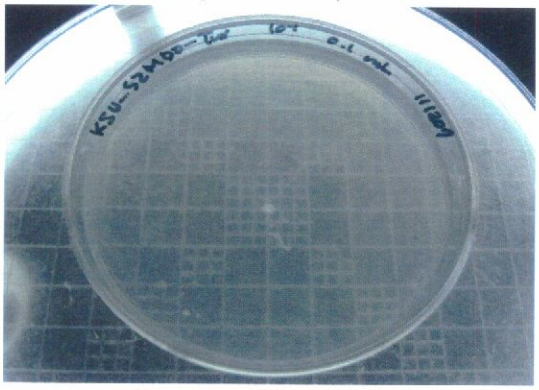
Heterotrophic bacteria

(Test water)



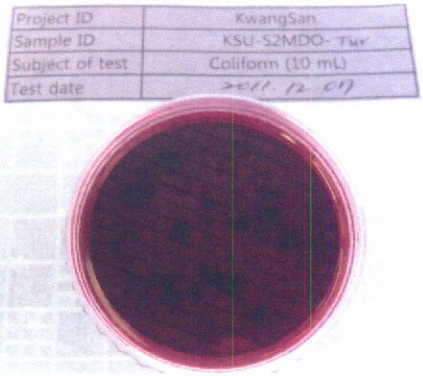
Total coliform

(Test water)



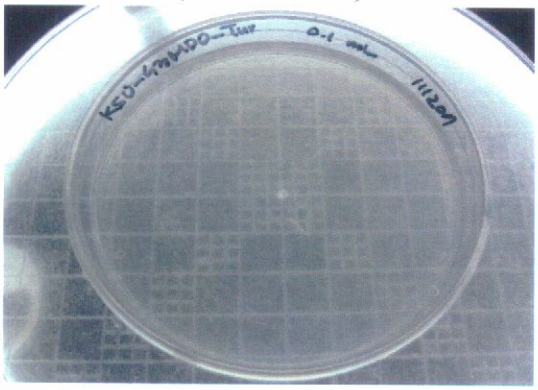
Heterotrophic bacteria

(Control water)



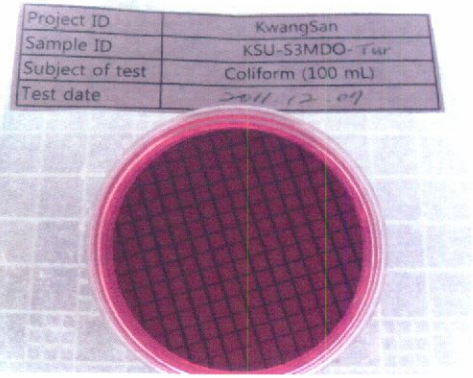
Total coliform

(Control water)



Heterotrophic bacteria

(Treated water)

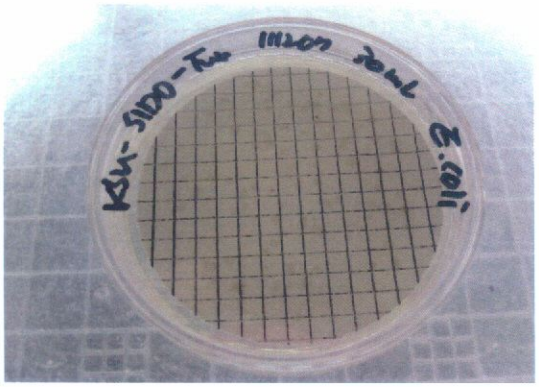


Total coliform

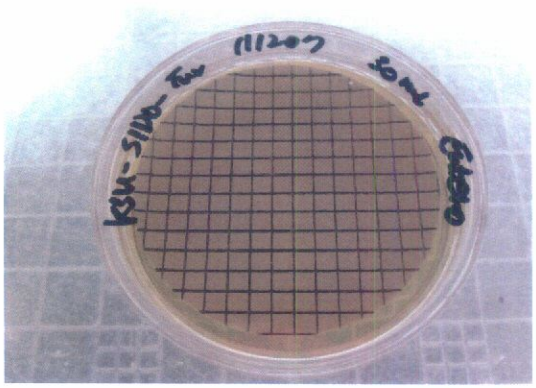
(Treated water)

3. To be continued

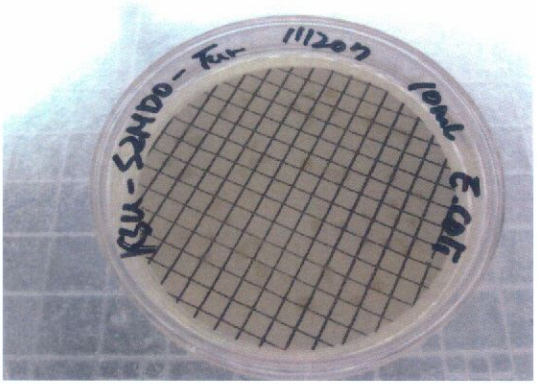
· **Ballasting (11th test cycle: 2011. 12. 07)**



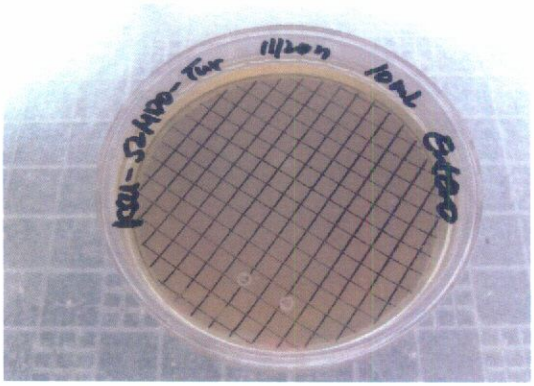
Escherichia coli
(Test water)



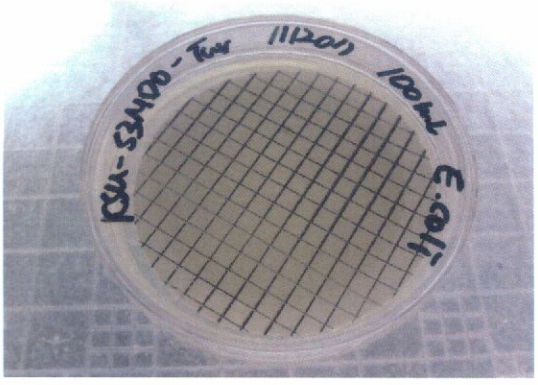
Intestinal Enterococci
(Test water)



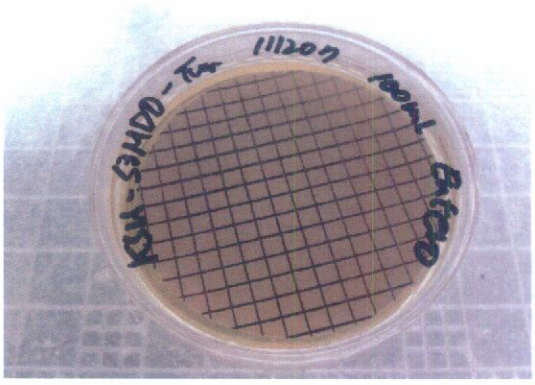
Escherichia coli
(Control water)



Intestinal Enterococci
(Control water)



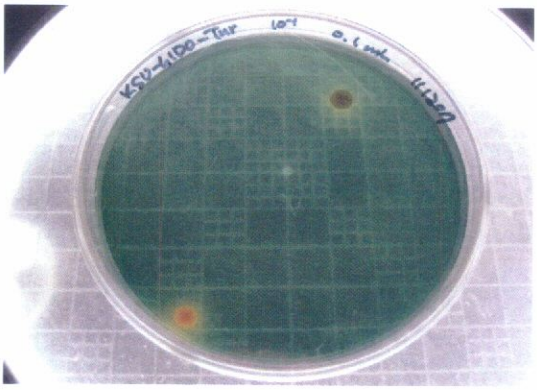
Escherichia coli
(Treated water)



Intestinal Enterococci
(Treated water)

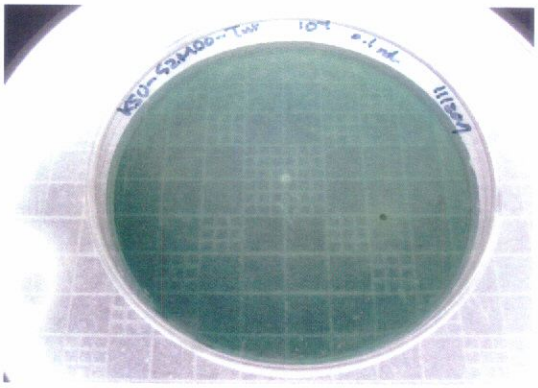
3. To be continued

· **Ballasting (11th test cycle: 2011. 12. 07)**



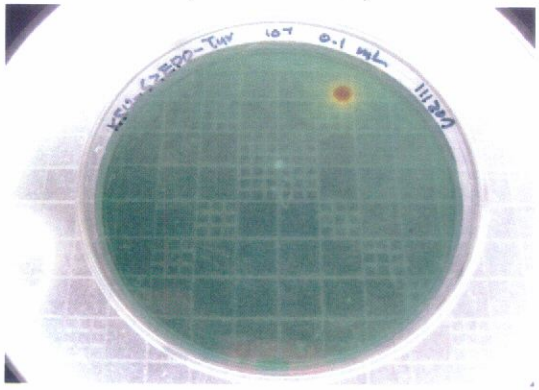
Toxicogenic *V. cholerae*

(Test water)



Toxicogenic *V. cholerae*

(Control water)

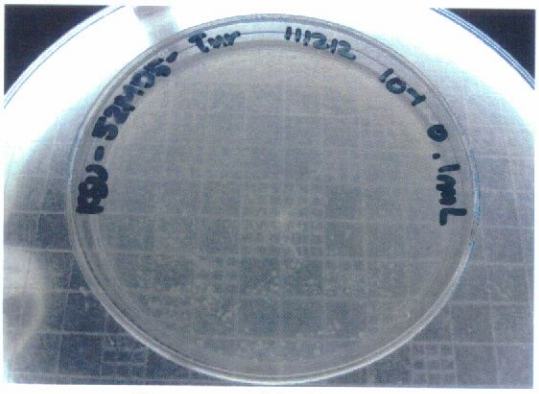


Toxicogenic *V. cholerae*

(Treated water)

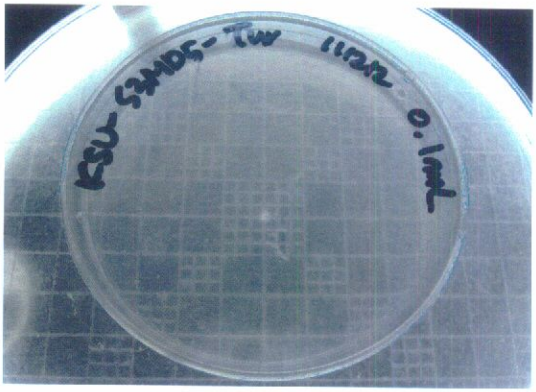
3. To be continued

· **de-Ballasting (11th test cycle: 2011. 12. 12)**



Heterotrophic bacteria

(Control water)

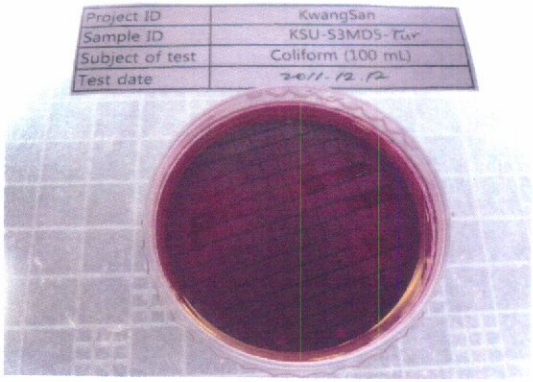


Heterotrophic bacteria

(Treated water)

Total coliform

(Control water)

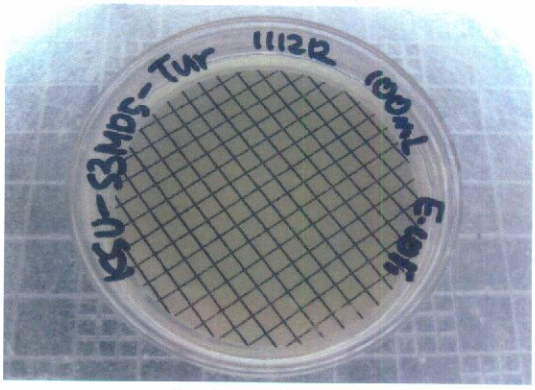


Total coliform

(Treated water)

Escherichia coli

(Control water)

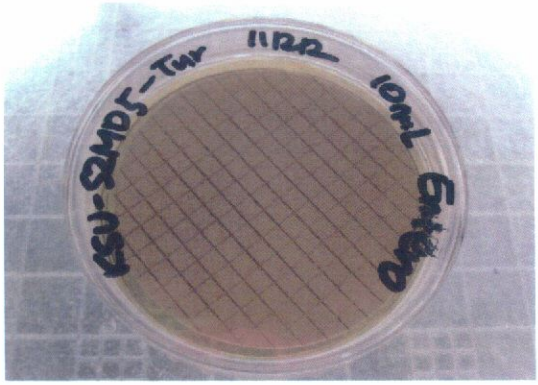


Escherichia coli

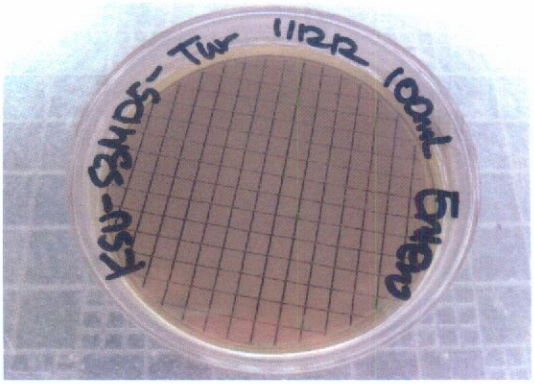
(Treated water)

3. To be continued

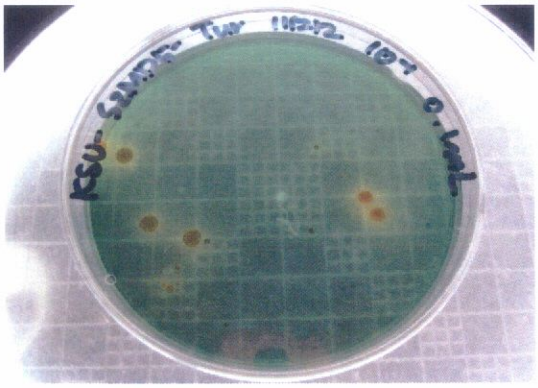
· **de-Ballasting (11th test cycle: 2011. 12. 12)**



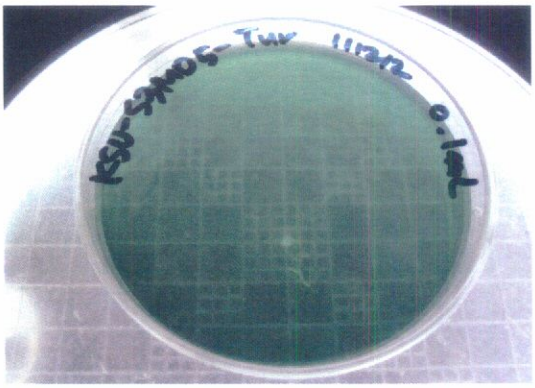
Intestinal Enterococci
(Control water)



Intestinal Enterococci
(Treated water)



Toxicogenic *V. cholerae*
(Control water)



Toxicogenic *V. cholerae*
(Treated water)